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THE BOSTON
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A Memorial Number

BY the coöperation of his friends this issue of the BOSTON MEDICAL AND SURGICAL JOURNAL is dedicated to Dr. John Preston Sutherland. All of the original articles presented herewith have been prepared by associates of Dr. Sutherland who have felt that this united effort might convey a demonstration of affection and respect more acceptable than a material gift.

The papers will be compiled in a volume which can be procured at a later time.

PRESENT-DAY TRAINING IN MEDICINE

BY ALEXANDER S. BEGG, M.D., BOSTON

Dean of Boston University School of Medicine

RECENT events in a sister State indicate in a spectacular manner the importance of emphasizing adequate medical training and the necessity for the profession assuming a stand which will protect the public against incompetency. Widespread discussion of present-day medical education, its aims and ideals, is of extreme importance and can hardly be over-emphasized. Only in this wise can public leaders be kept familiar with the trend of events and provide the necessary safeguards for public welfare; for regulation will always be slow in coming, since, as pointed out by Kelley:[1] "There is a general misapprehension that the law at any particular time ought to represent the highest view and the highest form of truth. The law never can be that, but always lags behind truth as ascertained at any particular time."

What concerns us, therefore, is present-day ideas as to what constitutes adequate medical training for those who are to be allowed to care for the health of the community and how to bring these ideas to the attention of the thinking public. It is evident, however, that we are considering but one department of education, and that the same feeling of dissatisfaction and unrest which has resulted in such remarkable progress in medical training has been present in other fields, and today we find much being said in general educational literature which has a profound significance in medicine.

One cannot take up such a discussion without fixing some limitations, and I have, therefore, spoken of "present-day" ideas. There is a great temptation to give much space to the historical consideration, for the enormous literature is of great interest, perhaps fully as much from what we know of the writers as from their development of the subject; but the experiences of the past are chiefly of interest in showing what progress has been made from the old mysticism to modern rationalism in medicine,—a progress fraught with controversy, but a true evolution. While one may truly say of certain methods and principles, "as old as the pyramids",—since the Egyptian School flourished coincident with their construction,[2]—there seems to be a tendency towards liberalism gradually creeping into the whole educational scheme, and we are glad to note that the medical schools are not the last of the departments to see the desirability of such a change.

One of the great contributing factors of our present-day status has been the classification of our American medical institutions and the close scrutiny of their equipment and methods of instruction by the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges. This, and the publicity given the matter by the Carnegie report,[3] has been most effective in bringing about changes. We have, as a result, passed through a period during which "standardization" has been the watchword, with perhaps undue emphasis upon the department, the course and course content. We may have encouraged the poorer student and penalized the better one. We certainly have constantly asked for more figures, more data, so that we might smooth out the inequalities in our plotted curve, and we have apparently been successful in an attempt to average our product and to turn all out of a common mould. But it is probable that this tendency has been discovered in time and we can look with encouragement upon the recent attempts to restore individuality to the different schools in the country and greater elasticity in their programs. We have, then, come far from the "dark ages" of medicine, through our self-inflicted "inquisition," to a period when we recognize the relation of our part to an educational whole,—that the medical school is a part of the university and shares its privileges and obligations.

It is impossible to discuss medical education by itself, for the training which a medical student has received prior to his entrance to the medical school has a profound bearing upon his subsequent progress and serves as an important link between the medical and other departments

of the university. There has been, perhaps, too much of a tendency to make literal use of the unfortunate term "pre-medical" and regard all of the training received prior to entrance into the medical school as almost of professional character. It is believed that the original intent, since become rather subordinated, of the college requirement was to insure a certain breadth of development and the acquirement of a certain amount of culture. We do not desire to go to an extreme and, as Dewey[4] says, make a "cult out of culture," but we must allow as much broadening as time permits, and not place undue emphasis upon "required subjects," which can only result in "professionalizing" at a too early date.

We have not allowed ourselves to stop with a scrutiny of the college, but have pushed on into the high school, specifying in much detail what shall be done. We have lost sight of our own disturbed reaction under lay criticism, and have attempted to usurp the functions of another professional group to which we in turn appear as laity. We may, however, be privileged to ask some questions concerning things for which we may in the main have been responsible, and ask the professional educators to give the matter thought. In the first place, is instruction really "graded"? For example, is the physics of high school planned to lead into the physics of college? If so, what means are there for removing the handicap of the beginner who takes up the college phase without that of the high school? What should be the practice regarding the languages, including English? Where are the natural mile-posts at which decision may be profitable? What really is now "primary" and "secondary," as applied to our school system? When and to whom should be given the opportunity for investigation? There is, it is true, ample justification in an attempt at a general plan of preliminary training, for we are concerned with elevating the tone of the profession, and at the same time assuring as early graduation as is possible. The difficulty is in preserving a balance between what is technically necessary and what is culturally desirable.

A point which has been mentioned, but which needs some further discussion, is the question of the age at graduation from the medical school. A study of this subject, published in 1917, was made by the Council on Medical Education and was presented by Arthur Dean Bevan.[5] It appeared from this study that the average age at graduation in 1916 was 26.5 years, and that, with the addition of hospital training, the age upon entering practice was 28. Attention was called to the earlier age at which the European student began his life work, but it was pointed out that, if our students would begin their primary school training at six years of age, from one to three years saving would result. In a welcoming address to a group of visiting physicians in Boston a few years ago, President Lowell called attention to this matter and placed much of the blame at the door of the profession, since in many instances the physician's advice to the parents was responsible for delayed entrance into school work. The study referred to above is interesting when one compares the findings from a questionnaire which was sent to representative men in special clinical fields for a report published by Wilson[6] in the *Journal of the American Medical Association* in 1920. The average age of this group at graduation was 24 and the average year of graduation was 1894, a difference of two and one-half years in a period of twenty years.

What, then, should be our aim in attempting to turn out a well-rounded product at an age somewhat earlier than obtains at present? We cannot hope to accomplish it within the time under our own control. We must encourage the earlier entry of children into the primary grades, and must not permit the better students to be held to the performance of the average but, by a proper sorting, insure as rapid a progress as is consistent with the individual's capabilities and by this means shorten somewhat this period of school life.

When we consider the high school and, subsequently, the college, we may incline to the belief that a considerable portion of the time must have been ill spent. I am by no means sure that this is the case, and I believe that a careful study of the situation will show more to have been accomplished in this period than is perhaps generally admitted. Inasmuch as it is impossible to foresee in most cases what calling the high school student is to follow in later years, and since one of the outstanding features in our recent medical graduates is said to be a lack of broad cultural training, it might be well to encourage the taking of the so-called classical courses in high school. Upon entering college, however, the student should begin to have some notion regarding his future, and he may well plan to take such work as may be required for entrance to the medical school. It does not seem advisable, however, to lose sight of what might be termed a basic principle; namely, that entrance to medical school is to follow a definite period spent in preparation for the baccalaureate degree. The subjects usually required for entrance to medicine are, in many cases, likewise required for or applicable toward this degree, so that it is only a matter of taking them somewhat earlier than might otherwise be the case. The extra requirement in chemistry is the one exception, and can be handled as a special problem.

Let us, therefore, leave this matter of preliminary education to those whose interest is in its development as a result of direct participation, and not attempt an unwise policy of rigid dictation.

With the student having completed his high

school and college training, there should be some method of aiding the professional school in selecting its entering class. Grades alone, although important, are not sufficient, and it is hoped that some means may be devised in the various colleges as a result of which some estimate of the student may be formed. The things to be considered should include his personality, his character, his ability to labor under stress and his probable attitude and development in a profession which is so intimately connected with public welfare as is the case in medicine. It is not yet clear how far we may follow the results of the newer psychological tests, and in many places much weight is given the opinions of the college instructors, particularly in science.

Of the medical school proper, volumes have been written in recent years and within its walls discussion never ceases. The annual educational conferences, held under the auspices of the American Medical Association, the Association of American Medical Colleges and the Association of State Boards of Registration in Medicine, are very profitable. They allow free discussion of current practice and suggestion as to betterment. As a result of this close grouping also, medical educational thought finds more rapid legislative response than could otherwise be the case. Then, too, the faculties of the better schools are constantly striving for local improvement, and will keep the curriculum elastic, so that it will continue, as Dean Winternitz[7] has recently said, "to facilitate experimentation in medical pedagogy."

If a medical department of a university is to discharge its obligation to the public and its own members, it must so plan its work that various ends may be served. Practitioners of medicine, workers in public medicine, investigators and teachers are to be its product. Again, we turn to a worker in the field of general education, for Brooks[8] has stated the case when he writes, "the great problem of the university is to send forth men so trained that the results of all scholarly research may find the largest field of influence for the betterment of conditions of life and living." The result of an appreciation of this obligation has been the establishment of the full-time teacher in certain fields, with a resulting improvement in research as well as teaching. The addition of this group has done more to approximate the university ideal than perhaps any other factor. As a result, it is hard to say just where a medical department ceases to be a cultural university department and becomes a professional school, and every effort should be made to increase the difficulty of such a distinction.

The methods of presenting material, of arranging sequence of interlocking departments, must be left for each school to arrange, practically the only check being the laws and regulations governing State registration; and these will rapidly fall in line with progressive thought. It makes little difference which scheme is adopted,—whether the method of interdigitating a series of courses, a method of concentrating upon given subjects for given periods or the ingenious method proposed from Toronto[9] of classifying instruction under various bodily systems,—so long as the scheme is applied by interested and enthusiastic originators and not adopted in a half-hearted manner by mediocre copyists. There must be a balance, however, between the endeavor on the one hand to teach a subject for the sake of this particular branch of science and, on the other hand, the tendency to subordinate all instruction to the professional end. Nor is it for us to decide for an institution what is to be done about the proportion between lecture and laboratory work, for while there is an essential agreement with Minot[10] that "Knowledge lives in the laboratory," there is much to be accomplished by lecture and reading assignment.

With the understanding that a considerable freedom is to be allowed in the planning of the medical school curriculum, it is unnecessary at this time to discuss the matter in very much detail. It will be for the university to decide, after considering its personnel and resources, what constitutes a department and when and where the work is to be undertaken.

In the laboratory departments the general practice of utilizing full-time instructors gives assurance that development will continue. We may see some changes in alignment and association, for as knowledge in a field increases, there is always a tendency to appoint new custodians for subdivisions, reluctant as the parent is to relinquish control over the offspring. There are sufficient guardians to assure ample discussion before radical departures are made. The present tendency appears to be to bring the student in contact with the patient at an earlier stage in his training, and much interest in the laboratory subjects can be aroused by the use of carefully selected cases; but the limit to which this method can be carried with profit, as well as the danger of over-emphasis, must constantly be borne in mind. We will probably never see the French "stage hospitalier" generally adopted in full in America, nor, on the other hand, do I believe we will ever return to the former sharp division between the pre-clinical and clinical teaching. It will aid materially in preserving proper balance, if the younger clinical men are encouraged to work in the laboratory departments. In this way it will be possible to carry over into the clinical service the more recent changes in nomenclature and method and, at the same time, bring to the attention of the laboratory staff the pressing problems of the clinic. Another important aid in establishing proper correlation of teaching effort is the conference in which members of the laboratory and clinical staff take part, with presentation of case records, with autopsy findings and other

data before the students. With an interested group the method is admirable, but, handled as a routine, it can be of little use.

In connection with clinical teaching, there should be a better utilization of the wonderful opportunities in the out-patient department of the hospital. At the present time in many institutions this work is inefficiently treated, as it is apt to be handled in a very haphazard manner by the less competent assistants in the department, whereas, with the present tendency of the medical graduate to take appointment in a hospital, the strengthening of his out-patient training while an undergraduate is absolutely essential. We all know the advantage of studying the large number of incipient cases which are seen here and, I think, most of us realize the splendid opportunity for the application of preventive measures. This department will rapidly become the important one of the hospital and it would seem to be the duty of the head of a clinical department to interest himself in the out-patient work, and it would also seem advisable to shift a considerable part of this teaching to the final year. This feature of the clinical program will call for an increase in staff and an added expense in most cases, but it will be justified by results.

It is obvious that the importance now attached to teaching in the wards, and of placing increased responsibility upon the student, is justified. The clinical clerk and the junior intern loom large in most institutions, but occasional return to the much-abused amphitheatre clinic might well be considered for the stimulation to student and staff resulting from an enlarged discussion.

We may turn now from the consideration of matters already well under way towards successful realization and consider a problem which has been the subject of much recent study. I refer to the various phases of preventive and public medicine. It is admitted that while much has been learned, we have not yet arrived at a generally satisfactory method of presenting the subject to the undergraduate in medicine. Courses in hygiene, in preventive medicine and public health, have been and still are attempted in many schools, with inequalities made evident in Hiscock's[11] recent report; but it is impossible to say from a study of catalogues how much may be under way which does not lend itself to survey in this manner. There is not a department which does not have frequent opportunity to contribute to the subject, and in many unexpected places much stress is being laid upon it. Enthusiastic workers must be encouraged wherever they may be, for here again local conditions will indicate local solutions. Instruction in preventive measures are, and will continue to be, the duty of all departments, whereas training in public health administration, vital statistics and the more special mass problems of public and industrial medicine must fall to those specially trained. It is perhaps too early to expect a program which will give general satisfaction, for we are still too close to the experiences which have provided opportunity for the study and have not yet acquired a proper perspective.

There is no freedom in a curriculum if the student is allowed no choice in his work. There must be some selection on his part, without necessarily encouraging a premature tendency towards specialism. This means, of course, the institution of optional and elective teaching, with opportunity for choice throughout the four years. We look with respect and even envy to those universities so situated that arts, sciences and medicine are all taught upon the same campus. This makes for the ideal, and in such places we can look forward to an increase in the number of electives taken in language, mathematics, economics, as well as chemistry, physics, biology and the more closely related medical subdivisions. The lessened hour schedule in the medical school should permit development here, as shown by Toronto's[12] experience. "Electives" have too often only allowed the student a choice between two or more clinics, where essentially similar work was conducted by different teachers, and not a real choice of actual subjects.

While the professional and cultural training is going forward, some attention must be paid to the moral development of the student, for with the mixing of various racial groups it is quite possible to have a somewhat disturbed, if not distorted, notion of such an involved question as professional ethics. The whole matter of the relations existing between the graduate in medicine, his colleagues, the general public, and his patient must be carefully dealt with, if we are not to see the dignity and prestige of an old and honorable profession impaired. It may be true that example is the better way, but precept is likewise essential.

Such a program is expensive, but we have long known that medical education is perhaps the most expensive form of professional training. Conditions now are not those existing when the schools of the country gave an annual course of lectures and of which Mall[13] wrote that, "students paid a single fee, for which they heard much, saw little, and did nothing." In a bulletin[14] published by the Bureau of Education it was shown that the average cost per student during 1920-21 was $655.00, whereas in 1916 this was placed at $419.00. Still more recently, an education survey in Massachusetts by a Commission appointed by the Governor states "that the total annual expense for medical education may easily reach $1000 per student: this, of course, does not include the student's personal expense."[15] It is undoubtedly true that in some of the more recent experiments in which school and hospital are being more intimately associated there will be valuable informa-

tion which may result in a decrease in the considerable item of overhead expense. It is apparent that in no instance can a medical school be satisfactorily conducted on the fees received from students. It is also evident that the development of our scheme of financing medical education must be altered so as to permit State aid in a much larger measure than at present, if ideals of democracy are to be maintained. Newman[16] writes: "It is of vital importance to the State that medicine should be well and soundly practiced, for upon the effective discharge of its duties depends the extension of the frontiers of life. Yet, this cannot be rendered apart from efficient medical education, which in its turn cannot be furnished exclusively out of students' fees or university endowments."

Many things are charged against the matter of the high cost of medical education, such as lack of opportunity for the student without independent means, the scarcity of physicians in rural communities, the persistence of inferior schools, and the existence of cults. None of these charges, however, are fully sustained. There is ample evidence to show that a large number of students in the very best schools are dependent financially upon their own efforts, supplemented frequently by scholarship aid and access to loan funds, while the migration of the physician to larger centers is part of a general picture. The persistence of the inferior school is largely due to academic, rather than financial, difficulties on the part of its students. The cult problem cannot by any stretch of the imagination be assigned here. There were cults when medical degrees were both cheap and plentiful, and they will continue as long as there are those willing to make capital of human suffering or to enlist human credulity in the interest of their own vagaries.

Never before has there been as keen an appreciation of the aims and claims of medicine by the laity as the present, nor has there been so much direct support in a material way. One has only to glance over a list of the organizations now concerning themselves with welfare work in its various aspects to realize the general interest, and it oftentimes happens that a group outside of the profession points a way to betterment. The Massachusetts Commission, above referred to, made up of educators in other fields, states that "notwithstanding this high cost, one of the primary obligations of society is a generous support of medical education."[15]

It seems safe to conclude that medicine has entered upon a new era and that the conspicuous progress in recent years has been coincident with improvement in medical education. We can look forward confidently to the future and shall not be discouraged because this progress is not equally rapid in all departments simultaneously. It is to be expected that certain fields will, for the moment, outstrip others, but this in itself means eventual progress along the entire front. Those responsible for the development of medical education are keenly aware of the trend of events and can be trusted to encourage that training and research which is essential in our effort to render service to mankind.

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NUTRITION WORK AS A BASIS FOR HEALTH EDUCATION AND THE PREVENTION OF TUBERCULOSIS

BY MURRAY P. HORWOOD, PH.D., CAMBRIDGE, MASS.

Assistant Professor, Department of Biology and Public Health, Massachusetts Institute of Technology

THE remarkable development of sanitary science and preventive medicine during the past seventy years may be divided into three distinct periods, one dealing with the development and applications of sanitary engineering, the second with bacteriology, and the third, with physiology. While the principles of these three sciences must be simultaneously applied in the conduct of a modern public health program, it must be evident that the greatest forward steps in the preventive medicine of the future, in our larger cities, must necessarily deal with the application of the principles of physiology to the daily lives of the people. That this is becoming more and more apparent, is evident from the phenomenal growth of all health educational activities, and the ever-growing emphasis on the right conduct of life, or the principles of personal hygiene. Pure water supplies will always be required, and likewise adequate facilities for the removal and disposal of sewage, garbage, manure, and other forms of organic refuse; but such necessary elements in the pub-

lic health fabric, have in the main been provided for in our larger cities, and where defects exist, they usually can be remedied by an adequate appropriation of funds. With the principles of healthy living, the problem is much more complex. Here, every individual must be taught what those principles are, and as each new generation appears the lessons must be repeated. The task is endless as well as stupendous, but further progress against certain diseases like tuberculosis, influenza, and organic diseases of the heart, must depend on the continuation of an effective campaign of health education.

One of the most important health educational agencies in the United States today is the National Tuberculosis Association, with its network of state and local associations extending all over the country. These organizations have been preaching the great value of rest, fresh air, adequate and wholesome food, exercise, cleanliness, medical examinations, and other desirable health habits for almost twenty years. As new information concerning healthy living was disclosed, this would be incorporated into their health educational program, and so it isn't strange that when the newer knowledge of nutrition began coming to light, they also introduced this new instrument into their program.

Accordingly, scales were extensively introduced in schools and clinics, children were weighed and measured, tables were compiled showing the average weight for both sexes for a given age and height, and those children who were found to be more than 7 or 10 per cent underweight were placed in special nutrition classes. Recently there has been a tendency to underrate the value of these classes. This reaction has been due to the variety of normal weight schedules available, each of which professes to be a standard for determining sub- or malnutrition. It is also true that underweight, according to the existing standards, does not necessarily mean undernourishment, for the various available standards have not taken into consideration the part which race, heredity, and other factors play. A child presumably underweight may be perfectly well and normal, while another child presumably of normal weight might really be in need of careful medical supervision. Furthermore, a child might be of normal weight and still be malnourished. Similarly, underweight may be due to physical defects, such as defective teeth, and enlarged tonsils and adenoids, or to over-exercise and lack of rest, or to a defective diet, or previous disease. It is recognized, too, that such factors as the intelligence of the parents, as well as their economic status, likewise play an important part in the nutrition of children.

In spite of the shortcomings of the nutrition standards now available, the emphasis on nutrition and the organization of nutrition classes, witnessed during the last few years, have been very worth while. The scale and the measuring rod are simple tangible things which even the ordinary mind may understand. If it is true, as the author believes it is, that one of the most serious shortcomings of the recent rapid development in science is due to our neglect in translating the accomplishments and discoveries of science into the language and lives of the great mass of people, then it would be indeed absurd to discard an effective agency which makes this aim possible in preventive medicine. It has been said that the expectancy of life can be extended twenty years if the public health information now available could be disseminated among the people and made a part of their daily lives. To the lay mind, underweight is always a danger signal, and such individuals will invariably adopt any prescribed rules of living, in the hope that they may gain in weight and strength, and thus ward off the possibility of disease. The nutrition class is thus a powerful instrument for promoting good health and for the establishment of good health habits.

Children who are enrolled in nutrition classes usually receive a thorough physical examination. In this way, early cases of tuberculosis are sometimes discovered, and such children are often removed to sanatoria for further treatment. Likewise, early cases of heart disease may be discovered and proper treatment provided. Similarly, many physical defects are observed, and these are always corrected in order to insure each child a fair opportunity to gain. It is often amazing to see the rapid increase in the weight chart after the removal of enlarged tonsils or adenoids, or the correction of defective teeth. But these benefits are not all, for, in addition, each child receives a mid-morning or mid-afternoon luncheon, consisting of pasteurized milk and graham crackers, or bread and butter. Whenever possible, rest periods during the day are provided, and each child is required to have a rest period in the afternoon after school is over. The mothers are invited and urged to come, especially at the weekly weighings and measurings, and there, before them, the physician or special nutrition worker analyzes each case and describes the reasons for improvement, or prescribes rules of daily living which will enable them to attain that desirable goal. In this way, the children and parents are instructed in the principles of good personal hygiene, and much interest is stimulated and focused on the problem of healthy living. With the follow-up work which the nutrition worker or public health nurse performs in the home, the chain of supervision and instruction is completed. The nutrition class is simply attempting to do for a larger number of children who are not tuberculous, what the open-air schools have so successfully done for the pretuberculous children on a smaller scale.

The importance of good nutrition in the prevention and treatment of tuberculosis has recently been re-emphasized as a result of the

experiences of many countries during the world war. Countries suffering from malnutrition and undernourishment showed an alarming increase in the morbidity and mortality from tuberculosis, while the death rate from tuberculosis in the United States was steadily being diminished. Dr. von Pirquet, the celebrated Viennese pediatrist, who had a great deal of experience with tuberculosis in children during the war period, was evidently convinced that food was the greatest factor in preventing and combating tuberculosis. Dr. Eugene R. Kelley, State Commissioner of Health for Massachusetts, in a public address delivered recently, also maintained that the key to the ultimate conquest of tuberculosis is locked up in good nutrition. While nutrition is undoubtedly one of the important factors in the control of tuberculosis, it is exceedingly necessary not to ignore or minimize the part which adequate rest plays in the prevention and treatment of this disease. An adequate supply of good food alone will probably not prevent or cure tuberculosis, but the diet must be closely related to rest, to fresh air, and to regulated exercise, in order to be effective. Rest and food are so closely related in some of their ultimate effects on the body that one should never be completely divorced from the other. On the other hand, rest provides an opportunity for repairing the body, and for the process of anabolism, which food alone could not do. In short, the progress against tuberculosis has been due to a variety of factors, among the most important being rest and absence of unnecessary fatigue, an adequate supply of good and wholesome food, better sanitary facilities, and a wider appreciation on the part of the public of the principles of healthy living. These conditions have been brought about through a general increase in wages and improvement in the standards of living, an improvement in housing, as well as in the conditions prevailing in industry. Other effective agents in the anti-tuberculosis campaign have been the tuberculosis clinic and sanatorium, the visiting nurse, the pasteurization of milk, the supervision over public food supplies, medical and nursing supervision over school children, more effective health department organization and operation and, finally, the great popular campaign of public health education which has been waged on such an extensive scale.

In view of what has already been said of the importance of nutrition work in the anti-tuberculosis campaign, it is interesting to examine this phase of the work in the anti-tuberculosis program of a large American community. During the summer of 1922, the author had an opportunity to study the status of tuberculosis work in Philadelphia, and the following is but a brief statement of the nutrition work which was being conducted at that time.

Nutrition work in Philadelphia was begun July 1, 1920, through the organization of so-called "portable health clinics" at eleven recreation centers by the Philadelphia Health Council and Tuberculosis Committee. As a result of this work, Camp Happy was organized in August, 1920, and during August and September 150 children were cared for at the Camp. In September, 1920, the first nutrition class was organized, with headquarters at the Chest Department of the Jefferson Medical College Hospital, at 238 Pine Street. Of 800 children from the near-by Wharton School who were weighed and measured, 140 were found to be 10 per cent or more underweight, and 25 of these were selected to make up the first nutrition class. The work was conducted along the lines outlined earlier in this paper, and the results were evidently so encouraging that demands soon came from other parts of the city, and from many school principals, to establish nutrition classes in their own schools and sections. By February 1, 1921, the success of the nutrition classes had become so well established, that the Division of School Medical Inspection of the City Health Department requested the Philadelphia Health Council to establish as many nutrition classes in the public schools as the budget of the Health Council would allow. Accordingly, nutrition classes were organized in at least seven schools, and as the success of the classes became more and more apparent, the number of schools included was extended. The first nutrition class in the parochial schools was established in the fall of 1921, and shortly after that, three other schools were also included. Here, control groups were observed simultaneously with the selected groups, and in each case the children in the nutrition classes made better gains both in weight and height. Nutrition classes were organized at various hospitals, too, and special classes were established for colored children.

Another agency in Philadelphia actively interested in nutrition work was the Child Federation. Through this organization most of the nutrition classes in the parochial schools were organized and conducted, the work being done with the coöperation and under the supervision of the Division of Medical Inspection of the Parochial Schools of the Philadelphia Department of Health. In addition, the Child Federation organized and conducted nutrition classes at various hospitals and public schools, and also at the Health Centers of the Division of Child Hygiene of the Philadelphia Department of Health. Courses in nutrition were given to several hundred public health nurses, engaged in almost every branch of public health nursing. Special instruction was also given to the dental hygienists of the University of Pennsylvania Dental School, and to the nurses and dietitians in approximately 28 hospitals.

The Child Federation also supervised the nutrition work at the Babies' Hospital, and there, a food and nutrition clinic was established. Some of the subjects considered at the meetings

of this clinic were the buying of foods, the preparation and cooking of food, the food values of different foods, and the part played by various foods in health and disease. Foods were actually prepared in the presence of the mothers and children attending the clinics, and special menus and recipes were also distributed. The food prepared at these clinics was always distributed, and the opinion of those present on its palatability was obtained. These clinics were held one afternoon per week from November 15, 1921, to July 1, 1922, and during that period 1097 mothers and children attended.

In order to enable the children attending the nutrition classes of the Philadelphia Health Council to retain the increase in weight gained during the school year, through the vacation period as well, Camp Happy was established in 1920, through a coöperative arrangement of the Philadelphia Health Council and the Philadelphia Department of Public Welfare. The camp was located within the city limits, northwest of the Holmesburg Junction Station of the Pennsylvania Railroad, and near the Delaware River. In 1922, there were 30 tents for boys and 47 for girls, situated along separate company streets on either side of the mess hall. Each tent had six cots, and each child was provided with a separate aluminum cup, and with special camp clothing. The children were only required to furnish sneakers, a bathing suit, sweater, comb and tooth brush. Running water, flush toilets, and separate shower baths for both sexes were also available. The children selected came almost entirely from the nutrition classes in Philadelphia, and stayed at the camp for periods, usually varying from one to three weeks. The fee for maintenance was only nominal, and varied from $.25 to $2.50 per week, the amount depending on the ability of the child's parents to pay. Children admitted to the camp varied in age from 6 to 14 years. At the time of inspection, there were 121 boys and 131 girls at the camp.

The supervision of the children was quite complete. Each child received a thorough medical examination and a complete medical and social history of each case was obtained. Medical and nursing care was available at all times. Children had to be free of physical defects before being admitted to the camp, so that they might be free to gain. One-hour rest periods were observed both morning and afternoon and were supervised by the special councilors connected with the camp. A special mid-morning and mid-afternoon luncheon of milk was also provided. In addition, the children were organized into separate groups, for story-telling purposes, and on such occasions the principles of healthy living would invariably be emphasized. The camp really was a preventorium, and was evidently doing excellent work. Since this study was made, the camp was transformed into a preventorium and is open throughout the entire year.

It must be evident from the foregoing brief and incomplete description of the nutrition work conducted in Philadelphia, that a great deal of emphasis has been properly placed on the relationship between nutrition and the development of an adequate vital resistance against disease. It must also be apparent that the nutrition work has been used as a basis for inculcating in the minds of parents and children certain fundamental principles of healthy living which it is hoped will be woven into their daily lives. The living organism must eat in order to live, and there is ample evidence already available, and growing more abundant each year, that the quality, composition and character of our daily foods, as well as the quantity, have a pronounced effect on health and well-being. Scientific nutrition is only in its infancy, and much remains to be done to disseminate what knowledge we already have to the great mass of people. Here, then, is a potent force not only for building up the resistance of the organism against disease, but for the development of hygienic habits which are equally important for the promotion of health and the prevention of disease.

A PATHOLOGICAL STUDY OF THE INCIDENCE OF SURGICAL MAMMARY LESIONS

BY W. H. WATTERS, A.M., M.D., BOSTON

So much has been appearing during recent years in the medical press concerning the alarming increase in the prevalence of cancer that a short résumé of one small section of the field may not be amiss. This brief paper will deal merely with the personal experience of its writer.

During the past twenty-three years I have been consecutively connected with one general hospital. This institution has had a more or less differentiated clinetele which has remained essentially the same during the entire period. The type of patient has, therefore, been practically constant throughout the years. By a hospital rule all tissues from patients, whether private or house, must be submitted to the pathologist for examination and report. During this almost quarter of a century I have, then, with the exception of a very few months, personally examined among other tissues practically every mammary gland that has been removed either in part or in its entirety as well as various tumors removed therefrom.

Table I gives an outline of this work. As will be seen, the cases are arranged according to diagnosis and are grouped in five time periods. The first period covers three years, each of the others, five years. Adeno-fibroma and fibrosis have for purposes of this classification been

grouped together, as in earlier years some undoubted cases of fibrosis were placed in the tumor group. And again, at times, from material received absolute differentiation may be difficult. A total of 1385 specimens have in this way passed under observation and study. Of these, as might be expected, by far the largest number are carcinoma. Those where axillary involvement was also present have been noted, although

TABLE I

	Totals	1901-03	1904-08	1909-13	1914-18	1919-23
Carcinoma	653	126	109	159	126	133
Carcinoma with axillary involvement	213	9	59	25	67	53
Basal cell carcinoma	1	—	—	—	—	1
Colloid carcinoma	5	—	2	1	2	—
Adeno-carcinoma	36	9	7	13	6	1
Cysto-carcinoma mammal	3	—	2	1	—	—
Adenoma	28	3	4	5	12	4
Papilloma	2	—	—	—	2	—
Papilliferous cyst	20	2	2	1	8	7
Sarcoma	4	1	—	2	1	—
Melanoblastoma	1	—	—	—	1	—
Fibroma	59	1	7	16	18	17
Fibroma intracanalicular	61	8	7	10	12	24
Adeno-fibroma and fibrosis	267	15	31	72	65	84
Adeno-myoma	1	—	—	—	—	1
Fibro-myoma	2	1	—	1	—	—
Lipoma	9	—	3	2	3	1
Mastitis	11	3	1	—	2	5
Actinomycosis	1	—	1	—	—	—
Adipose tissue	8	—	—	—	2	6
Totals	1385	178	235	308	327	337

probably some cases thus involved have not been included because the axillary tissue was not in earlier years always submitted. The probable explanation of the low percentage of axillary metastasis in the first time period is that at that date the present extensive axillary dissection was not then always made.

When one studies the lists of carcinoma cases a slight increase in the total number is clearly seen. Had the total population of the hospital remained the same size numerically during the period this increase would be significant, as it also would be had the total number of surgical cases remained stationary. The years have, however, witnessed a great increase in the number of people treated. So in Table II an attempt has been made to show the rate of increase of both total cases and cancer cases and the varying ratio of one to the other.

TABLE II

	1901-03	1904-08	1909-13	1914-18	1919-23
Total Patients	7710	20,175	26,281	38,118	44,036
Total Surgical Cases	6553	13,550	16,697	19,817	22,749
Total Carcinoma of Breast Cases	135	168	184	193	186
Ratio Carcinoma Cases to Total Surgical Cases	1 to 48.5	1 to 80.6	1 to 90.7	1 to 102.7	1 to 122.5

As will be seen, there has been an almost negligible variation in the total number of cases of cancer of the breast submitted for laboratory examination. In fact, if the years 1899 and 1900 had shown the same number of cases as did the three following years, the actual number of cases in the first quinquennium would have been two hundred and twenty-five, or a number much in excess of any similar period since.

The ratio of cases of cancer of the breast to total surgical operations is also a prominently decreasing one. From these figures alone one might deduce the conclusion that mammary cancer is now only about one-third as frequent as it was twenty-five years ago. Many facts must be taken into consideration, however. In the first place a considerable increase in the sphere of surgical operations has occurred, thereby decreasing the ratio to any one form of lesion. This might be partly neutralized by the more accurate and early diagnoses of these conditions now made. The rather rapid increase in the number of small suburban hospitals also is said to have changed quite materially the character of the work in the larger institutions. It is difficult to understand, however, why it should have filtered out over one-half of this particular group of cases. Other explanations may account for this rather surprising result, at least in part. Taking these things into consideration as reasons for them, the facts obtained from our laboratory records are:

First, That there are actually fewer cases of cancer of the breast now received at the laboratory annually than were received twenty or twenty-five years ago.

Second, That the ratio of such cases to total surgical operations was two and one-half times as great a generation ago as it is today.

Third, That a steadily increasing proportion

of non-malignant mammary conditions now coming to operation may in part account for this apparent retardation of the malignant ones. Finally, it seems reasonable to assume that in this particular clientele the rapid and alarming increase in the incidence of cancer elsewhere reported does not hold good in regard to mammary conditions.

THE DIAGNOSIS OF GLAUCOMA

BY DAVID W. WELLS, M.D., BOSTON

THERE is no brighter page in the history of ophthalmology than the successful treatment of glaucoma, if diagnosed in its incipiency; but there is nothing more pathetic than the discovery of the neglected case.

This neglect happens so frequently notwithstanding the many warnings sounded by ophthalmologists, that it is evident that the general medical profession is not yet sufficiently impressed with the importance of the subject.

Glaucoma is a condition characterized by increased intra-ocular tension.

The main coating of the eyeball, the sclera, is a tough, fibrous tunic, which is practically indistensible. The lymph, which nourishes the anterior portion of the eyeball, is secreted by the ciliary body and the posterior surface of the iris, passes through the fibers of the suspensory ligament of the crystalline lens, thence through the pupil to the anterior chamber.

Having performed its office, it must then be gotten out of the eyeball. The outlet is through a little canal which surrounds the base of the cornea, the canal of Schlemm, thence into the venous radicles and into the ophthalmic vein.

This circulation maintains the normal tension of the eyeball. Any obstruction to this exit must of necessity increase the tension within the globe.

By the law of hydrostatics, this pressure is transferred to all the structures inside of the sclera. It presses the iris up against the lens and it presses backward against the optic nerve, causing an atrophy of the nerve fibers which means progressive diminution of vision.

Anything which tends to close the outlet will cause increased tension. Thus glaucoma is often secondary to many intra-ocular diseases.

The discussion of the *cause* of *primary simple glaucoma* is beyond the scope of this present writing, but it is this form which is most prevalent and is most frequently overlooked. If the eye is otherwise diseased, the case will probably be under the care of an ophthalmologist, who would be on the alert for any symptom of increased tension. But the simple case has usually progressed considerably before any of the classical symptoms are sufficiently pronounced to excite the interest of the patient or the family doctor.

The progress of such a case is not usually steadily downward. There are exacerbations and ameliorations, and it is these exacerbations which should be recognized and the disease should then be diagnosed by the general practitioner.

SYMPTOMS

First, it is not necessary for the patient to complain of halos around a light, although this is always set down as a classical symptom.

The *pain* is deep-seated, severe, not confined to the eyeball but passes up over the brow.

Nausea and even vomiting are common, so common that the patient often attributes the pain in the eye to his vomiting.

Dimness of vision—slight or pronounced.

Redness of the white of the eye without catarrhal discharge.

Dilatation of the pupil.

Shallow anterior chamber.

Haziness of the cornea seen by oblique light.

Increased tension, recognized by palpation with the finger tips as compared with the other eye. This symptom, although pathognomonic, is put last in the list because its recognition usually requires trained fingers.

If the diagnosis is made at the first or second attack, it is usually possible to prevent further progress and preserve all the vision remaining. Besides the loss of vision, glaucoma reduces the *field of vision* in a very characteristic way. Certain sectors, corresponding to the nerve fibers undergoing the atrophy, are lost.

It is not uncommon for patients to retain very good central vision until the field is contracted to 10°.

Glaucoma is a disease of middle and advanced age, seldom seen under 40, although the writer had one case, involving both eyes, aged 32.

Glaucoma is a bilateral disease. The other eye is sure to become involved sooner or later.

Recognition at the first acute exacerbation is possible if every case of eye disease in which there is severe pain and any loss of vision is referred to the ophthalmologist. It may prove to be iritis, but this also should be under the care of one versed in eye diseases.

The universal failure of opticians and refractionists to recognize early glaucoma is a sufficient reason for discouraging patients from consulting such people for glasses, as rapid change in refraction is often one of the early symptoms.

While it is possible to diagnose a marked case of increased tension by palpation, every ophthalmologist makes use of an instrument of precision called the tonometer, which registers the tension in terms of mm. of mercury.

This is just as important in the diagnosis and management of a case of glaucoma as the sphygmomanometer is to the general practitioner.

Since the field of vision undergoes contraction, this is carefully mapped by the ordinary perimeter, and the size of the blind spots determined

with great accuracy by the stereoscopic instrument.

The treatment is both medical and surgical, but must be omitted, as the object of this paper is to focus attention on the diagnosis.

Probably more eyes are permanently blinded by glaucoma than cataract, because cataract blindness is curable by operation in 80 per cent. to 90 per cent., but absolute glaucoma is hopeless.

There is nothing more pathetic for the ophthalmologist than the neglected case and, unfortunately, this is a frequent experience.

The great teacher, whom we honor today, was wont to say, "A nervous system is an arrangement by means of which an organism becomes conscious of its environment (food, friends and foes) and adapts itself thereto." This applies equally well to the ameba and to man.

The eye is the most highly specialized development of the nervous system, and faithfully reports its sensations to our consciousness. The anamnesis is quite often sufficient for the diagnosis of glaucoma if one knows the symptom-complex.

The writer recently took a patient's history, the salient points of which were taken down by his secretary. No objective examination had been made, not even taking of vision. The secretary was then asked for a diagnosis and immediately replied, "glaucoma."

Given early diagnosis, there need be few cases of blindness from simple glaucoma.

STOMATOLOGY: SHOULD IT OCCUPY A PLACE IN THE MEDICAL SCHOOL CURRICULUM?

BY LEROY M. S. MINER, M.D., D.M.D., F.A.C.S., BOSTON

THE pathology of the mouth, its diagnosis and treatment has never received much serious attention in medical school teaching or in the field of clinical medicine. The general practitioner of yesterday was keen in his observations of the tongue, and used that organ freely as an aid in diagnosis. Who, of the present generation, does not remember as a child the familiar "let me see your tongue," when the doctor came to treat some disability in the household? But, beyond this, the average physician has confessed to an ignorance of the mouth. The reason for this is plain. The mouth has been regarded as the special province of the dentist, and dentistry has developed as a separate profession quite highly specialized. Hence the physician has not concerned himself with this field.

But during this last decade, infections of the mouth and their secondary effects in other parts of the body have attracted the serious attention of the medical profession. Medical and dental literature has abounded with articles on various phases of this subject, expressing a wide divergence of opinion. Opinions have not infrequently been formed from inconclusive and incomplete evidence, and conclusions frequently have been based on faulty premises. Extravagant claims of remote diseases being caused by infected teeth have been too common.

One result of these inaccuracies of thought is an accumulation of half truths leading to unwarranted treatment. Another, is the reaction that naturally follows extravagance of statement, which tends to discredit the whole subject.

In the survey of the entire subject, and in the attempt to discover the facts, it seems quite clear that the clean cut separation of medicine and dentistry has been an obstacle in the path of progress. The development of dentistry until recently has been largely mechanical. The teaching and training in dental schools has been directed toward the development of a high operative dexterity. The reputation for skill that American dentistry possesses indicates how well the dental schools have done their work in this direction, but the lack of knowledge of general pathology, physiological chemistry, and the other fundamental sciences has been a serious handicap to those dentists trying to develop their work in the broader field of stomatology. That the physician knows little about the mouth, its physiology, pathology and bacteriology, admits of no argument. I cannot help but believe that had physicians as a class known more about stomatology, the problems in connection with dental focal infection would have been more scientifically and more efficiently handled, especially in their clinical application. A chair in stomatology in every medical school, even with the medical school curriculum already admittedly overcrowded, is greatly needed, and its establishment is logical in the light of the present-day development in the everyday practice of medicine. The value of such a chair, not only in teaching, but for the promotion and direction of research work in the subject (something so sorely needed), should be quite definite, and should fill a decided gap in the training of men for the practice of medicine.

Back in 1910, before dental infection began to attract much attention, teaching of diseases of the mouth and their relation to the rest of the body was started in the medical school of Boston University, in the department of clinical medicine, under the leadership of Professor Fred B. Percy. As time and events developed the importance of the subject, Dean John P. Sutherland (whose place in medical education is secure) and others of the faculty saw the desirability of dignifying the subject, and an associate professorship of stomatology was established. So far as can be learned, this is the first medical school to establish such a chair.

The opportunities in stomatology for clinical and laboratory research are unlimited, and much

of the territory is virgin soil. Not only has the subject of dental disease in relation to secondary systemic disturbances many problems yet unsolved, but the direct opposite of this; the secondary changes in the mouth due to systemic disease is a subject of first importance and concerning which we know little.

Disturbances in the mouth from changes in the blood itself or in the circulation, from disturbances of the glands of internal secretion, from diseases of the kidney, pancreas, skin, and other organs have been described.[1]

Sir Kenneth Goadby in his recent book, "Diseases of the Gums and Oral Mucus Membrane," has a chapter devoted to this subject. But our knowledge is altogether surprisingly limited. Men are sorely needed with the broadest possible training to undertake these problems, the solution of which will be of untold value in the prevention of disease. Money given for the endowment of a department of stomatology, in any medical school, would be a great public service in the interests of preventive medicine.

The etiology of dental caries—that most prevalent of all diseases, which causes so many far-reaching disturbances—is yet unsolved. As a nutritional problem, it offers many allurements.

The mechanical aspects of dentistry admittedly do not interest the average medical men, but dental caries, as a broad biological problem, needs and should attract the best brains of the medical profession.

As dental caries is essentially a disease of childhood, so that other common disease of adult age, pyorrhea, or Riggs' disease, is continuing to produce its ravages among its many victims. While splendid research work has been already done, the medical man with research inclinations will find much of interest here.

Even from this brief outline of some of the outstanding problems connected with stomatology, it must be evident that a real need exists for a larger knowledge of these problems by the physician, and that instruction in the medical schools will help to solve some of the difficulties. With the opportunities for promoting public health, by the development of the science of stomatology, the wisdom and foresight of Dean Sutherland is apparent, and other medical schools can follow with profit the lead of Boston University in establishing chairs in stomatology.

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TECHNIQUE OF INGUINAL HERNIOTOMY

CHARLES T. HOWARD, M.D., F.A.C.S., BOSTON

Operation for inguinal hernia has been done for a great many years, but it was not until the publication of the first report of Bassini's in 1891 that the operative technique was in any measure satisfactory. For many years subsequent his operation was considered as the last word. Then numerous modifications were advocated, until today there are almost as many types of operation as there are operators. The success or failure of any of these operations must, of course, be estimated in terms of percentage of recurrences. Dr. Masson in the 1920 volume of the Mayo Clinic gives statistics from three of the larger clinics. According to these figures recurrences occur in from .55 to 1.8 per cent. Now unfortunately, while no statement is made as to how these statistics were compiled, a study of the figures themselves seems to show that they are based upon the total number of operations and the known number of recurrences. Were the percentages based upon the number of cases followed up for at least one year it is evident that the percentage of recurrences would be much higher. Moschowitz, in the article on hernia in Johnson's Operative Therapeusis says, "In general, it may be stated that published statistics vary as to the number of recurrences from 1 to about 8 per cent. I am convinced that, if all cases were tabulated correctly, the percentage of recurrences would be considerably higher than those given."

If the best results are to be obtained herniotomy must be classed, in the surgeon's mind, as a major operation, and great care must be given to points of seemingly minor importance. Two points in general technique which every surgeon recognizes are first, of course, the maintenance of strict asepsis, and second the avoidance of tying the sutures too tightly. If the tying is relegated to his assistant, unless that assistant be thoroughly trained, the surgeon himself must watch carefully or often strangulation of tissue with subsequent necrosis will occur, even in an uninfected wound.

Now, in performing herniotomy there are three factors to be considered: First, the disposition of the hernial sac; second, the disposition of the cord; third, the closure of the inguinal canal. In order to form an opinion as to the relative importance of these factors let us consider the results in different types of operations.

Kocher of Berne, Switzerland, devised an operation which practically took into account only the obliteration of the sac. He made an incision through the skin and fat down to the fascia; then with a specially designed forcep grasped the tip of the sac at the external ring, invaginated it through the canal and turned it wrong side out through a button-hole incision at the internal ring. The sac was then twisted, ligated and sutured at this point and the excess trimmed away. The canal was reinforced by one or two sutures plicating the fascia.

With this simple procedure his statistics showed 5.4 per cent. recurrences, and his associate, Imfeld, had equally good results. His operation is far from ideal, and his statistics are quoted merely to emphasize the importance of dealing properly with the sac. After the sac

has been dissected out and excised the stump should be drawn up and sutured well above the internal ring. If the stump be left at the internal ring there will be a peritoneal dimple at this weak spot and the aerostatic pressure of the bowel will gradually enlarge this dimple until the hernia recurs. If this dimple is high up against sound muscle no harm will ensue. This point must be carried out in any type of operation that may be selected.

The Disposition of the Cord.—With the advent of the Bassini operation the question of transplanting the cord was given great prominence, and almost simultaneously Halsted of Baltimore brought out his operation. He laid great emphasis upon cord transplantation, and managed it by incising the internal oblique muscle for a distance of about one inch above the internal ring, and then brought the cord straight out through the fascia, sutured these structures snugly around the cord, leaving it buried in the fat layer. With this type of operation, which laid so much emphasis on cord transplantation, he had 6.3 per cent. recurrences.

Closure of the Canal.—In the Andrews operation stress has been laid upon closure of the canal. The defective technique of the Bassini, insomuch as the strength of the wound in that operation depends upon the union of muscle to fascia, has been overcome. The suturing of the fascia with the underlying muscle to the shelving edge of the ligamentum inguinale and the imbrication of the fascia of the external oblique gives a strength to the wound which seems ideal both anatomically and theoretically.

So far we have called attention only to the selection of the type of operation and the generally accepted technical points to be observed. Success, however, depends upon the clean and strong healing of these wounds, more so indeed than in almost any other operation. In a series of cases recently reviewed by the author 37½ per cent. of the recurrences were in wounds that had suppurated. It is imperative, therefore, to eliminate this element of danger. We wish to call attention to two points in technique which from our own experience we feel has done much to eliminate these dangers.

First, the preservation of the blood supply of the fascia. As herniotomy is usually performed, the skin and fat are incised down to the fascia of the external oblique, the fascia is then wiped clean, and the glistening surface of the fascia exposed. In doing this one-half of the blood supply of that area is destroyed, and if the Bassini operation is done, when the fascia is lifted away from the muscle the blood supply on the under surface is also pretty well destroyed. On the outer side the tissues are of necessity wiped clean from the shelving edge of the ligamentum inguinale, so if the outer surface has been wiped clean in the first steps of the operation, the blood supply of the outer flap has been entirely destroyed.

The blood supply to the fascia consists in minute vessels running in a layer of thin areolar tissue between the fat layer and the fascia. These minute vessels can be demonstrated, if after the skin and fat are incised the fat layer be gently retracted, and if the areolar tissue be then wiped away with gauze the minute bleeding points of the torn vessels where they penetrate the fascia can be seen. If, during the course of the operation these vessels are entirely destroyed by a thorough cleaning of the fascia with gauze, the fascia practically becomes a fascial graft. Now of course grafts will live in the majority of uninfected cases, but in a certain percentage of cases the blood supply will not be re-established and the grafts will slough. We feel then that this very thin layer of areolar tissue should not be cleaned away but should be left *in situ*, and only the fat layer retracted sufficiently to give room for the placing of the sutures.

The second technical point to which we wish to call attention is what we have termed the splinting of the fat layer. Due to the fact that the hernia incision is low down and more or less transverse, each time that the leg is moved a rotary or churning motion occurs between the cut edges. This can be well demonstrated, if during the course of an hernia operation, after the fascia layer is sutured, the leg be moved in abduction, flexion, and extension. The thicker the fat layer the more pronounced is this churning; it is present, however, even when the fat layer is very thin. Any motion in the wound tends, of course, to permit the accumulation of serum and to interfere with the healing, in addition to the accumulated serum serving as an ideal culture media for bacteria. In order to obviate this danger we now always suture the fat layer with a fine catgut, and catch the underlying fascia in a few of the stitches. We do this in every case, even though the fat layer is so thin as to be hardly discernible. With this precaution taken any motion of the leg in no wise interferes with healing.

Since inaugurating these special points in technique, we have operated upon 156 inguinal hernias. The ages of the patients varied from a six-months-old baby, who was suffering from a strangulated hernia, to a seventy-six-year-old man. We have done the Andrews operation, without transplantation of the cord except in a few cases of direct hernia where special conditions seemed to demand it. Especial attention has been given to the fixation of the stump of the sac above the internal ring. The original points to which we wish to call attention, and on which much emphasis has been laid, are the careful preservation of the blood supply of the fascia, and the splinting of the fat layer, as indicated above. The suture material has been No. 2 chromicized catgut for the two deeper layers, and No. 2 plain catgut for the fat layer and the skin.

As regards the dressing. For the last 69 cases

we have used an impervious, transparent tissue sold under the name of Cellosilk. The skin and the Cellosilk are carefully dried, and adhesive plaster is used to hold this dressing in place. This seals the wound and does away with any danger of outside infection. It also permits of easy inspection of the wound without disturbing the dressing. On the fifth day this dressing is removed, the wound sponged with alcohol, and a dressing of gauze replaced. Occasionally there will be a little moisture beneath the dressing from maceration of the skin, and it is for this reason that we feel it advisable to remove it early. We have looked up our last one hundred cases for statistics of infections, and find one case that suppurated somewhat. His convalescence was delayed seven days beyond the average, but apparently the strength of his wound was not impaired as he has had no recurrence of his hernia. This case was one of those dressed with Cellosilk, but we do not feel that it had anything to do with the infection.

One Other Point in the After-Care.—We feel very strongly that hernia cases should be kept in bed longer than those with other wounds. The practice of letting them up on the eighth or tenth day seems to us injudicious. The whole success of the operation depends upon the sound, strong healing of the wound, and while it is healed in ten days the tissues are not sufficiently consolidated to bear the strain of the erect posture and exercise as early as the tenth day. We accordingly keep these patients in bed from fourteen to sixteen days, and feel that the extra time is well spent.

As Regards Results in This Series of 156 Operations for Inguinal Hernia.—We have two known cases of probable recurrence. One of these has been examined by her family physician, who reports a recurrence, so this case is positive. The second case writes, although he has not responded to requests to return for examination, that "the rupture has recurred to a slight degree." While somewhat uncertain about this last case we feel that he should be counted as a recurrent case. We have then two known cases in 156 operations, making a recurrence percentage of 1.3. This percentage is figured as I have indicated, because most hernia statistics have, I think, been compiled on that same basis, and hence a comparison is possible.

We have been able to obtain follow-up reports or examinations on exactly 50 cases, and of course the two recurrent cases reported above are included in this 50. Computed on this basis it gives us 4 per cent. of recurrences.

TRANSUTERINE INSUFFLATION OF GAS IN THE INVESTIGATION AND TREATMENT OF STERILITY

BY SAMUEL R. MEAKER, M.D., M.R.C.S., BOSTON

[From the Department of Gynaecology, Boston University, School of Medicine]

THE diagnostic procedure of artificial pneumoperitoneum combined with abdominal x-ray has been in use now for eleven years. The earlier workers produced a massive pneumoperitoneum, injecting one to two liters of gas or more by paracentesis of the abdominal wall. In this way it is possible admirably to demonstrate the presence of adhesions or tumors, and the size and position of organs.

Three years ago Rubin first published his work on pneumoperitoneum produced by transuterine insufflation. His interest was mainly in the question of tubal patency or occlusion, and so the amount of gas introduced was limited to as small a quantity as could be clearly demonstrated in the abdominal cavity—100 to 200 cubic centimeters. There is no reason, of course, why in the patent cases larger volumes cannot be insufflated by this route for purposes of general abdominal diagnosis. In a sterility investigation, however, it is usually sufficient to determine that some gas can pass through the tubes, and the use of a large amount is unnecessary. The Rubin test of tubal patency has been widely adopted, and is in most clinics a routine procedure in the study of sterility. The dangers originally foreseen, gas-embolism and peritoneal infection, have been proved to be non-existent, both by laboratory tests and by some thousands of clinical experiences.

Of the 50 per cent. of sterilities for which the female is responsible, about 15 are due to abnormalities of the Fallopian tubes. In most of these cases the trouble is of an obstructive nature, preventing the union of sperm and ovum. The obstruction may be partial or complete, and while clubbing over of the fimbriated end is the lesion most frequently observed, it is also common for the isthmic and interstitial portions of the tube to be affected. The usual cause of tubal obstruction is inflammatory disease. In addition to the various well-defined types of salpingitis, a factor not to be overlooked is the mild pelvic peritonitis often found with acute appendicitis, as a result of which the abdominal ostia of the tubes may be sealed.

In an investigation of sterility it is clearly of great importance to obtain all possible information about the condition of the tubes. To assess the tubal factor in this problem has in the past been exceedingly difficult by any means short of laparotomy. Neither history nor, in most cases, physical examination could be depended upon to give reliable information as to patency or occlusion.

If the Rubin test is positive—that is, if a

pneumoperitoneum can be produced by the transuterine route, it is conclusive proof that at least one tube is patent. No positive information is gained in regard to both tubes, nor can we be sure that the ciliated epithelium and the musculature of the patent tube, both of which are factors in the passage of the fertilized ovum, are efficient.

If no pneumoperitoneum is produced by repeated attempts at transuterine insufflation with proper technique, that fact may be accepted as demonstrating the occlusion of both tubes, though we are left in the dark with regard to the location and extent of the tubal damage. At any rate, such a negative result definitely shows the presence of a tubal factor in the case under investigation, and points out clearly a necessary item in the treatment.

The apparatus which I have used for nearly three years is shown in Figure 1. A cylinder containing gas under pressure is connected to a wash-bottle, in which the visible bubbling of the gas through water serves as an index to the rate of flow. From the wash-bottle leads off a tube which delivers the gas to the patient through an intrauterine cannula. About an inch and a half from the end of the cannula is a rubber urethral tip, by means of which a gas-tight blocking of the os externum is obtained. Connected by a T-piece to the tubing on the patient's side of the wash-bottle is a spring-manometer, recording the gas-pressure in millimeters of mercury.

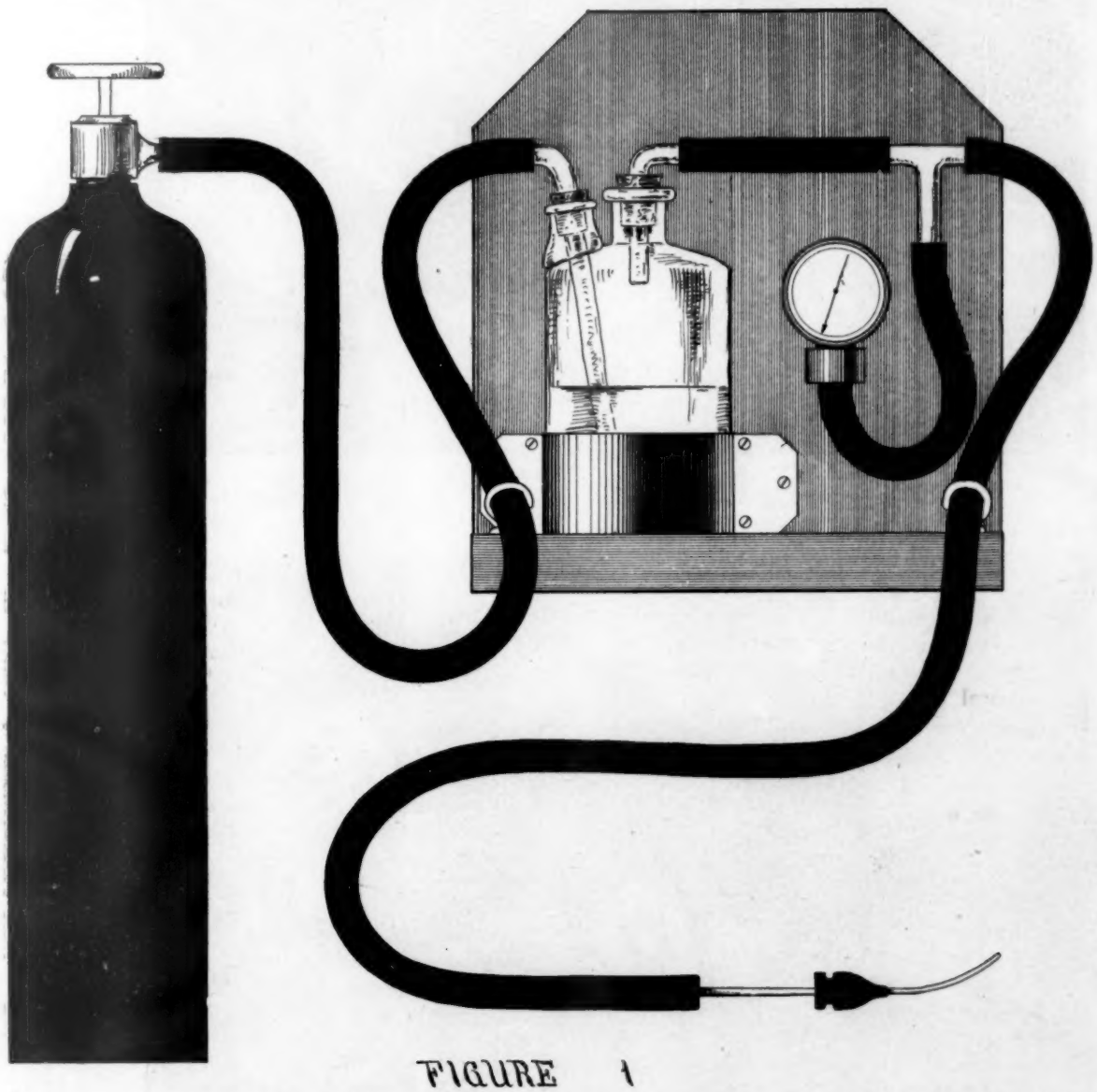


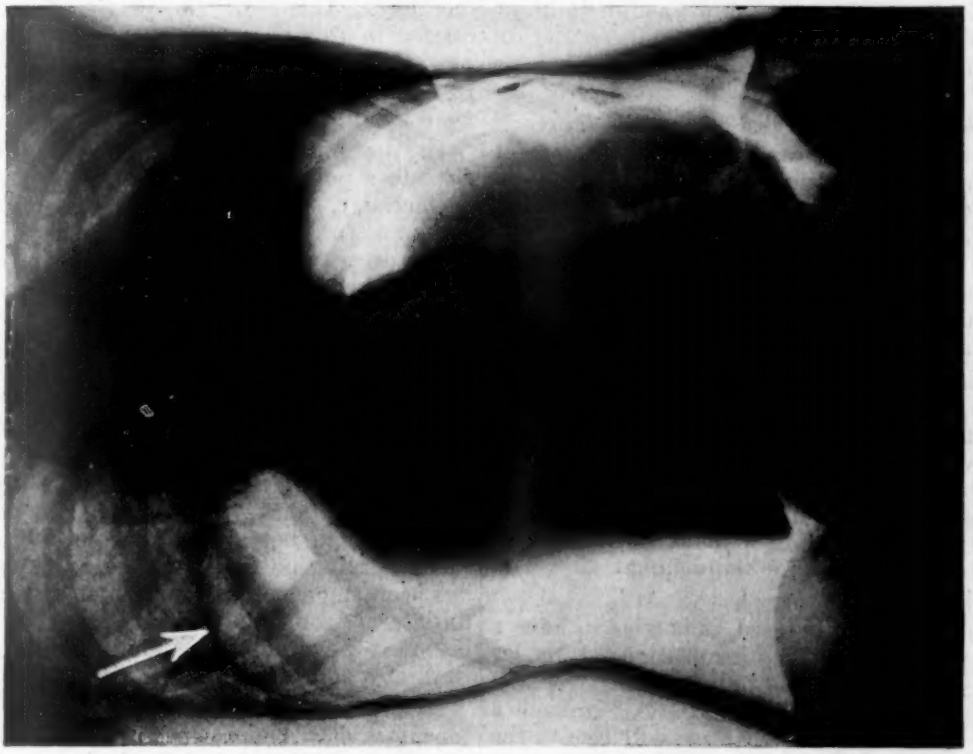
FIGURE 1

Other types of apparatus which have been designed for the same purpose are essentially similar to this, except that they have different methods for measuring the quantity of gas. Rubin uses a siphon-meter in the place of the wash-bottle. Others draw the gas from a bag into a graduated syringe, by means of which it is then injected into the uterus. Since the test

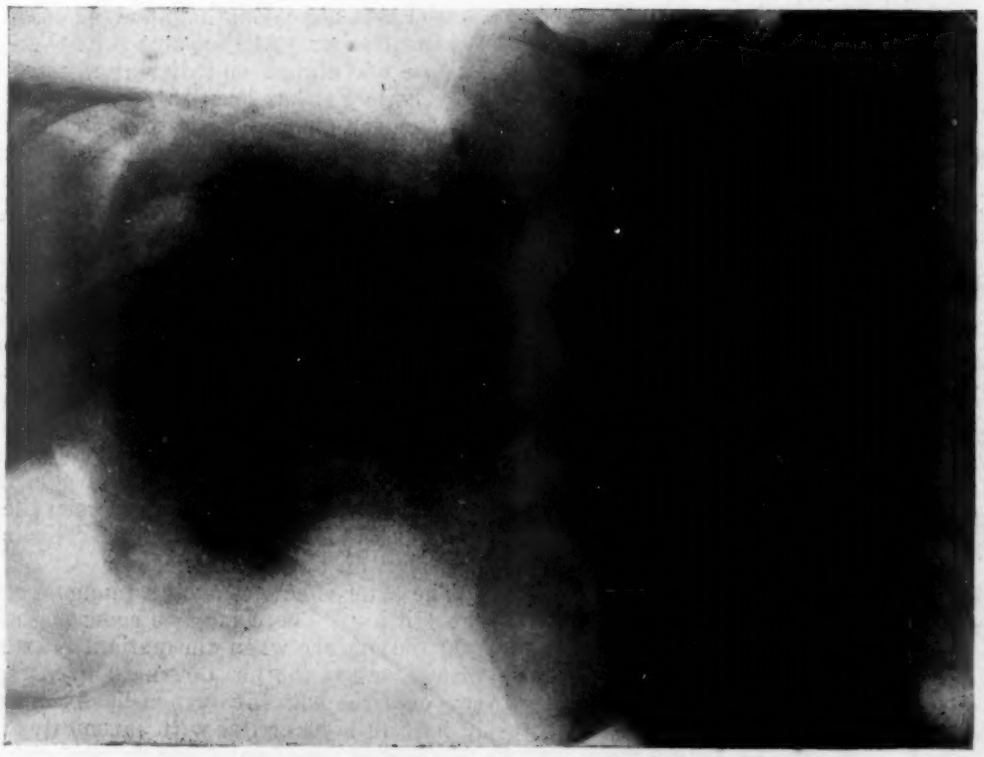
Mrs. I. O. Plate after Insufflation.

Mrs. I. O. Control Plate.

Mrs. I. O. (Private Series, No. 43). This patient has been married sixteen years. She had a dilatation and curettage eleven years ago, followed by a right ectopic pregnancy ten years ago, for which salpingectomy was done. Nine years ago a left salpingostomy was done. Since then only one pregnancy has occurred, that being three years ago, and terminating in miscarriage at two months. Apart from the tubal factor she presents no abnormality; the husband is normal. The post-insufflation plate shows no pneumoperitoneum. At the end of the arrow is an elongated shadow thought to be the left tube, and so proved by a repetition of the test after an interval of a week. Obviously the fimbriated end of the tube is sealed, and the uterine end is sufficiently spastic to retain the gas which has been introduced. In this case it is clear that the only hope of success lies in a second salpingostomy.



Mrs. B. S. Plate after Insufflation.



Mrs. B. S. Control Plate.

Mrs. B. S. (M. H. H. O. P. D., No. 158696). These plates show a positive result of the Rubin test. The amount of gas introduced in this case is about 500 cubic centimeters, more than twice the minimum quantity that can be demonstrated as a pneumoperitoneum. Note the displacement downward of liver and spleen. The arrow points to the diaphragm.

is purely qualitative, there is no special advantage in measuring with great accuracy the amount of gas used. In the apparatus here shown a rate of flow just slow enough to allow separate bubbles to pass through the water in the wash-bottle is the equivalent of 250 cubic centimeters per minute.

The technique of the test is simple. There is no need for special preparation on the part of the patient. Any time during the intermenstrual period is satisfactory for the test. I personally have not done insufflations in the presence of active pelvic inflammation, pregnancy, or acute endocervicitis, though others have reported the procedure carried out under these conditions with no bad results.

Whether the test is to be checked by x-ray depends somewhat upon the circumstances of the individual case. A positive result is usually very obvious without the confirmatory evidence of skiagrams, by means of signs and symptoms to be described presently. As a general thing I do the first insufflation without x-ray, and reserve that evidence for subsequent tests on doubtful cases.

If the x-ray is to be used, it is wise to have a control-plate taken before insufflation. In order to correspond with the post-insufflation plate, this should be taken with the patient in such a position that intraperitoneal gas will rise to the subdiaphragmatic region, where a relatively small amount can be demonstrated with ease. The standing position is the most satisfactory, though the patient may lie on a table which is tilted to raise the head and depress the feet as much as possible.

For the insufflation itself the patient lies in the ordinary dorsal gynecologic position, with the special feature that the shoulders are raised by pillows as high as is comfortable. This is important if one is to elicit the characteristic symptoms by means of a small pneumoperitoneum, since these symptoms come mainly from peritoneal irritation in the subdiaphragmatic region.

The cervix is exposed with a bivalve speculum, and is painted with iodine; it is then seized and steadied by a volsella-forceps. The intrauterine cannula, attached to its tubing, is introduced one and a half or two inches, to a point well above the os internum, while the rubber tip is fitted snugly into the external os. The direction of the uterocervical canal and its permeability to an instrument of the size of the cannula should have been ascertained at a previous examination.

The gas is now turned on at the cylinder. I consider it very important that the flow should begin slowly and be increased gradually, as otherwise there may be a certain amount of uterine colic, and consequent difficulty in forcing the gas through the interstitial portions of the tubes. The bubbles in the wash-bottle should not come faster at first than at the rate of one per second, and fully half a minute should elapse before the pressure in the system is allowed to rise as high as 100 millimeters of mercury. Little or no pelvic discomfort is caused in this way. It is easy to regulate the flow of gas at the cylinder, though some prefer to have a release-valve inserted into the system near the uterine cannula.

In the patent cases the pressure typically rises to a point between 60 and 100 millimeters of mercury, at which the uterine ends of the tubes are forced open. As this occurs there is a sharp drop to a point between 20 and 50 millimeters, where the pressure remains as long as the rate of flow is constant. Such behavior on the part of the manometer is one of the criteria of a positive test. Two other items of evidence may be obtained at the same time,—auscultatory signs in the abdomen, and certain subjective symptoms of the patient.

As gas passes through the tubes, a stethoscope placed just above the symphysis pubis will often, though not always, enable one to hear a soft whistling or gurgling sound. Auscultation has been suggested as a means of distinguishing unilateral from bilateral patency. My own experiences have not been definite enough to warrant any conclusions along that line.

Almost as soon as gas begins to enter the peritoneal cavity the patient, if her shoulders are elevated, will complain of pain in the upper abdomen, very often referred to the shoulders. This may be felt on either or both sides, but is rather more common on the right. Such shoulder pain is almost pathognomonic of a successful insufflation. At the same time there may be a sense of fullness and distention, even though very little gas has been introduced.

After the characteristic drop in pressure and the appearance of abdominal signs and symptoms, the gas is allowed to flow for about one minute longer, at a rate which causes 200 cubic centimeters in all to be introduced. In the presence of the three criteria described,—the drop in the manometer-reading, the auscultatory evidence, and the typical symptoms,—there can be no doubt about the positive character of the result, and x-ray is merely confirmatory. If skiagrams in such cases are taken with the patient standing, they will show a subdiaphragmatic collection of gas displacing the liver downward, and making the diaphragm very conspicuous as a solid structure between the abdominal gas and the air in the chest. This is usually best seen on the right side.

The after-effects of such a pneumoperitoneum are trifling. There may be some slight abdominal discomfort when the patient stands, which disappears as she lies down. This passes off in two or three hours if oxygen has been used, and in half an hour or less with carbon dioxide. For this reason the latter gas is preferable, especially for use in the office or in the out-patient clinic.

In the non-patent cases the picture is altogether different. The pressure in the apparatus rises steadily, until usually there is audible regurgitation of gas between the rubber tip and the cervix. It has been assumed by most workers that 200 millimeters of mercury represents the limits of safety, and in none of my cases has the pressure been raised above that point. If a pressure maintained at this level for three minutes results in no spontaneous drop, no audible passage of gas through the tubes, and no typical abdominal symptoms, then the result of that particular test must be regarded as negative, provided the technique has been correct. Such patients often mention a slight pelvic discomfort, but it is quite different from the upper abdominal pain characteristic of the positive result, and ceases as soon as the insufflation is discontinued. Skiagrams will, of course, show no pneumoperitoneum in these cases.

A mistake often made in the early days of this procedure was to assume that a single negative result definitely proved the tubes to be sealed. We know now that repeated insufflations will not infrequently give a positive result on the third, fourth, or even fifth trial, the previous attempts having been negative. It is difficult to say what happens in such cases, but quite possibly there may be actual dilatation of the tubes, separation of sticky mucous surfaces, and breaking up of light adhesions. My practice now is never to recommend laparotomy because of a tubal factor in sterility until six careful insufflations have proved negative.

Transuterine insufflation was introduced solely for its diagnostic value in the question of tubal patency or occlusion. From the beginning, however, occasional cases have been reported in which pregnancy occurred immediately after this procedure, without other treatment. Peterson records thirteen such histories, and the total number reported is considerable. It would appear that under certain circumstances the method has a therapeutic, as well as a diagnostic value. Here again it is hard to say exactly in what type of case it is indicated, or what occurs to bring about a successful result. In all probability the effect of the insufflation is mechanical, as in those cases where gas is ultimately forced through the tubes after one or more unsuccessful attempts.

I have had three cases, married and sterile for two, four, and ten years respectively, in whom pregnancy followed promptly the transuterine insufflation of gas. In each of these cases the factor of male responsibility was carefully excluded, and apart from the tubes there was no demonstrable abnormality in the female, excepting a small and insignificant cervical polyp in one case. In each of the patients considerable difficulty was encountered in forcing gas through the tubes; this was accomplished at the first attempt in two cases, and at the fourth attempt in the third. Two of the patients became pregnant immediately after insufflation, and the other in two months. No further treatment was resorted to in any of the three, except the removal of the cervical polyp above mentioned.

While we have only general ideas of what can be accomplished along these lines, I feel that insufflation is worthy of being tried repeatedly as a routine therapeutic measure in all cases where every factor, male and female, apart from the tubes has been excluded. Particularly favorable are the cases in which gas can be forced through, but only with some difficulty. It remains to be seen whether an unusually large proportion of ectopic pregnancies will follow this method of treatment. There is a further use for insufflation in the post-operative care of salpingostomies, to prevent fresh sealing over of the reconstructed tubal lumen.

VITAL FUNCTION STUDIES

III

A Short Series of Tests for the Diagnosis of Disturbed Endocrine Function

BY ALLAN WINTER ROWE, PH.D., BOSTON

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During the last two decades, and particularly in the last ten years, interest in the ductless glands and the disturbed states incident to their aberrant functions has been steadily growing. Prior to that time certain outstanding syndromes had been described by the observers whose names they bear. But the far-reaching significance of the endocrine system as potent regulators of growth, metabolism, and sex development has been rendered concrete during this later period.

To the dispassionate observer the present status of our knowledge of the functional activities of these several individuals is a collection of stimulating and suggestive observations rich in potentiality, rather than a compilation of established sequential facts, logically interrelated. Broadly speaking, the greater part of recent investigations fall into one of two categories; namely, well controlled, skilfully executed experimental studies on animals or series of careful and painstaking clinical observations. In the first field, the widely divergent results obtained by individual groups of investigators, equally skilful in experimentation and judicious in interpretation, leave the answer to many highly important questions still in abeyance. Further, the response of severely traumatized and even moribund animals does not form an altogether safe criterion for human performance. The wide differences observed in metabolic relationships even between members of closely related families—purin metabolism in man and the other mammals is a case in point—argues ex-

treme caution in the translation of animal experimentation into terms of human experience. On the other hand, the subjective element bulks unduly large in many of the clinical studies. It is no uncommon experience in the profuse literature in this field to find a diagnosis, based upon careful symptom study, warmly challenged by later critics, who draw wholly other conclusions from the same observations.* It follows naturally that in a field so rich in alluring possibility, speculation—not infrequently of a most uncritical character—should be rife. The diagnoses established by successful glandular therapy are equally susceptible to criticism. Even the use of a single substance may not be wholly determinative, as has been pointed out by several writers in regard to suprarenin. And the response of the male sufferer to a pleasing mixture of pituitary and thyroid, blended with ovary and mammary extracts, calls for high qualities of imagination in its interpretation.

For a number of years the author has been conducting studies in the hope of establishing certain objective criteria for the identification of disturbed endocrine function. The field of vital function testing offers rich possibilities in the application of the numerous tests already suggested, as well as in the formulation of new methods. In the main, however, vital function tests have been designed to indicate an individual dysfunction or aberration from the normal. With the highly complex control of bodily functions, it has followed as a natural corollary that the establishment of a test has been the signal for the recording of exceptions of both positive and negative character. This in turn has invalidated the specificity of the test, and in many instances discouraged further study. The writer has approached the problem from the opposite point of view and has selected those tests in which multiplicity of control factors has been demonstrated. The further selection of a series of such tests gives, not a single criterion of a single disturbed function, but a series of interrelated criteria in each of which several functional activities are involved. Thus, while several factors influence the magnitude of the result of each observation, it has seemed highly improbable that all of a series of widely divergent tests should be uniformly affected by each of the several elements involved. Another point that cannot be over-emphasized is the necessity of quantitative measurements. Differences as observed in many instances must be of degree and not of kind. Consequently, only the most exact methods available are suitable for this purpose, and these should be as rigidly quantitative as the intrinsic limitations permit. From this standpoint, a variety of tests has been investigated in the following manner.

Groups of so-called normal individuals have been subjected to the tests and the level of performance carefully noted. The second step was the selection of individuals in whom definite aberrant function limited to one predominant focus was demonstrable. To them, the same series of tests was applied, and the quantitative variations from the established normal—or average—determined. The relationships of these several differences thus established criteria for the determination of obscure and ill-defined disabilities.

For the reasons stated above, the studies have been confined to the human species. Recognizing the limitations thus imposed, it has been felt that the direct applicability of the results obtained offered abundant compensation.

As a result of these studies, a general method for the differential diagnosis of disturbed endocrine function has been formulated, the details of which will shortly appear elsewhere.

This method involves the admission of the patient to a hospital where, under rigidly controlled conditions of diet and daily regimen, an intensive study is carried out* for a period of seven days.† While the study is highly informative, it is time-consuming and the enforced hospital residence is a most hampering condition. Feeling that some measure of information might be secured by the application of the test in abridged form, a regimen has been devised from which the time-consuming—and, regrettably, highly informative—elements have been deleted. By these omissions it has been possible to compress a number of significant measurements into a single morning, thereby eliminating hospital residence and greatly conserving the patient's time. There is, naturally, a marked limitation in the amount and character of the information secured. While in a percentage of cases, it permits of the establishment of a working tentative diagnosis, in another it indicates the desirability or inutility of further inquiry along these lines.

The author wishes to emphasize that no claim for novelty is made. In other forms and under other circumstances, similar groups of tests have been applied. The "group consultant" system is one manifestation of the general idea. It is felt, however, that with the foundation of the extensive observations upon normals and of the quantitative differences induced by aberrant function, the results as obtained with the individual case have definite significance.

A. PLAN OF STUDY

The tests selected and methods adopted may be briefly discussed.

1. Basal Metabolism. As the studies of the last few years have shown convincingly, the basal metabolic rate is in large measure regulated by the activities of the ductless glands. Among other conditions which influence it are fever (checked by the temperature measure-

*While it is true that this sequence is not confined to the field of endocrine study, it is here of significantly frequent occurrence.

*While the method is probably adaptable to use in the home, the difficulties of control, and the element of inconvenience negative its desirability.

†Certain additional tests, if found necessary, may extend this period one or two days.

ments), degrees of inanition (checked by history, urine contents and physical factors), certain of the blood diseases (checked by the blood morphology), and diabetic acidosis (checked by alveolar CO_2 and blood analysis). In the writer's experience, the thyroid exercises the largest measure of influence, the gonads and pituitary being tendential rather than definitive.* The Benedict-Collins[1] portable units are used. Certain objections to the closed circuit type of apparatus have been successfully met, while others lack a warrantable basis. Results obtained are compared with both Harris-Benedict[8] and du Bois[4] standards, and when results are not widely discrepant (serious divergencies are rare) the mean is reported. The determinations are graphically recorded and compared, as made, by a simple method to be described elsewhere. Two concordant results are the minimum, and a third, or even a fourth, is run if the data are conflicting.†

If the results are so discordant as to necessitate further observation, the patient should be instructed to return another day. The latter case, however, is rarely met with.

2. Vital Capacity. The lung capacity is determined by a good water-sealed spirometer, the maximum of four or five observations being chosen. Other physical measurements are taken with standard apparatus and steel tapes. Both the Dreyer‡[3] and West[11] standards of comparison are used. Peabody[10] has shown the significance of these tests in certain types of heart lesion, and the author has observed significant variations from the average in endocrine conditions.

3. Alevolar carbon dioxide is measured by the Fredericia[7] method, or rarely with the Haldane apparatus, collecting in the writer's modification of the Plesch-Higgins bag. As has been shown by Fitz and Van Slyke[5] the carbon dioxide combining power of the plasma may be roughly computed from the urine ammonia and titratable acid.

4. The Wassermann is performed by the Massachusetts State Wassermann Laboratory technique,[9] using both simple and cholesterinized antigens.

5. The blood chemistry comprises sugar, nonprotein and urea nitrogen, uric acid, creatinin, and rarely chloride, quantitations following the Folin-Wu[6a] technique, with the exception of uric acid, in which the Benedict[2a] method has been adopted. It is planned to add other measurements, notably calcium and cholesterol, in future studies. The implications of these results are too well known to require discussion. The writer has observed, however, in many thyroid cases, a blood picture suggestive of incipient nephritis, which is restored to normal by treatment.

6. Blood Morphology. Haemoglobin is determined by both the Tallqvist and Sahli methods; red and white count by standard technique, and differential by a method soon to be described. It may be said, however, that the majority of endocrine bloods are lymphoid in character where dys- or hypofunction exists.

7. The phthalein test includes deep muscular injection, hourly collection and determination of amount of dye eliminated by the use of the Dubosecq colorimeter.

8. Routine examination of the urine is thorough and comprehensive. All abnormal constituents in solution are quantitated by exact methods. Total acid is titrated, using the Folin[6b] procedure.

9. Nitrogen Partition in Urine. The several tests applied are:

a.	Total Nitrogen.	(Kjehldahl)
b.	Urea.	(Folin (6c))
c.	Ammonia.	(Folin-Macallum (6d))
d.	Creatinin.	(Folin (6c))
e.	Uric Acid.	(Benedict-Franke (2b))

Until recently, the amino nitrogen was not determined as a routine procedure. The residual nitrogen is determined by difference and notably high relative values have assumed a definite diagnostic significance. The composition of this high residual fraction is now under investigation.

Of the special examinations, only two need any further explanation.

1a. The otological examination includes the Bárány test.

2a. In the ophthalmological examination a variety of observations are made in addition to plotting the eye grounds.

The sequence for the application of these tests can best be presented in tabular form.

TABLE 1

SCHEDULE FOR SHORT FORM

8:00 A. M.	Patient arrives with previous 24-hour urine collected over toluene. Rest period begins.
8:30	Basal Metabolism.
9:05	Phenol-Sulphone-Phthalein Injection.
9:10	Physical Examination (History).
10:05	Collect 1st Phthalein Urine.
10:10	Blood for Morphological Examination.
10:20	Blood for { General Chemical Analysis. Wassermann.
10:30	Special v. i.
11:05	Collect 2nd Phthalein Urine.
11:10	Special v. i.
12:00	Test concluded.

*The writer's experience with adrenal and parathyroid cases, as well as those of the other endocrine possibilities, is at present too limited to warrant a final statement.

†In the writer's experience, owing to nervous fatigue, four determinations is the maximum number that can be carried out profitably at one time, and in many cases three is a more judicious number.

and weight measurements in the obese involve uncertain extrapolation.

‡Only the standards based upon trunk length are used as chest

SPECIAL TESTS

1. Otological Examination.
2. Ophthalmological Examination.
3. Neurological Examination.
4. X-Ray Examination.
5. Special Physical Examination (pelvic, thoracic, etc.).
6. Heart Tracing.
7. Protein Sensitivity.
8. Cystoscopic Examination.

As will be seen from the above, the patient is instructed to report with the urine collected over toluene during the preceding 24 hours, the full amount being brought in. While the examination yields results that lack the final authority of material secured under the conditions of an exactly controlled metabolism experiment, the relationship of the several constituents is significant. Moreover, it gives some index of the patient's daily dietary habit, which is also of value.

Taken at once to the metabolism room, the patient loosens clothing and reclines on a bed for a rest period of never less than thirty minutes. Pulse records taken frequently serve to indicate the relaxation of the patient, and at the same time educate the subject to the operation, and so lesson any disturbing influence which might be exerted. Blood-pressure readings are taken between observation periods, with the patient still recumbent. A mercury column instrument with soft cuff is used, with a phonendoscope to indicate. Body temperatures are recorded at beginning and end. After the basal metabolism has been determined, the alveolar CO_2 is taken, followed by the test for lung capacity. The patient then goes to another room, where the phthalein injection is made, and then the physical examination is conducted. The disrobing of the patient for this procedure gives opportunity to secure the body weight and complete the physical measurements. At 10:05 the first phthalein collection is made. Special tests may here be interpolated. At 11:05 the second phthalein urine is collected, and there remains time for the patient to take other special examinations before discharge at from 12 to 1 o'clock. Certain variations in the above schedule can readily be made if expediency so dictate. It is important, however, that the basal metabolism constitute the first step, so that any extraneous factors of disturbance may be excluded. The patient may be given light nourishment after the blood samples are taken. It is essential, however, that fasting bloods be used for both the chemistry and morphology of this tissue. The numerous shortcomings of the schedule are, perhaps, as apparent to the author as to his readers. The substitution of other for existing tests is an obvious modification. This is done occasionally, where the type of case presenting demonstrates the desirability of such change. In the main, however, the plan as outlined has proven helpful, and in an appreciable number of cases, really informative. This can best be seen by the examination of some of the results.

B. RESULTS

As the data does not lend itself well to tabulation,* consideration of a single individual case report may form a suitable illustration. This is selected from the series on the basis of its representative character, typifying certain groups of cases encountered.

CASE No. 1731 (S-125).

The patient was a young woman 23 years of age. The chief features of disability were: a progressive fatigability, headaches, notable loss of hair, progressively developing obesity, nervousness, menstrual irregularity, marked constipation. The following data were obtained:

Physical Examination: Slight thyroid enlargement, acneiform eruption on back, obesity. Otherwise negative.

Routine Examination of the Urine:

Quantity	460 c.c.
Specific Gravity	1.029 at 15°
Urea	7 grams
Sugar	1.2 grams
Albumin, acetone and bile	absent
Sediment	negative

Nitrogen Partition

Total Nitrogen	4.58 grams	
Urea Nitrogen	3.31 "	72.2%
Uric Acid Nitrogen	.08 "	1.1%
Ammonia Nitrogen	.26 "	5.6%
Creatinin Nitrogen	.30 "	6.5%
Residual Nitrogen	.53 "	14.6%

Phenol Sulphone Phthalein:
First hour, 28%, second hour, 15%, Total, 43%

Alveolar Carbon Dioxide: 34 mm.

Blood Examination, Morphological:

Haemoglobin	95%
Erythrocytes	5,010,000
Leucocytes	11,100
Lymphocytes (small)	5%
" (large)	16%
P. N. Neutrophiles	70%
Transition Cells	4%
Large Mononuclear Cells	4%
Eosinophiles	1%

Blood Examination, Chemical:

Non-Protein Nitrogen	30 mgm.
Urea Nitrogen	11 "
Uric Acid	4 "
Sugar	91 "

Vital Capacity:

Weight	+18.1 kg.	+29%
Chest	+10.7 cm.	+14%
V. C. (Dreyer A)	—790 cc.	—22%
V. C. (West)	—720 cc.	—20%

Basal Metabolism:

Mean of	2 deter.	1467 Cal.
H.-B. Norm.	1626 Cal.	—10%
Du B. Norm.	1669 Cal.	—12%
	Mean	—11%

Blood Pressure 96/66 Temperature 97.8 Pulse 64
Respiration 22

*The present report is based upon a series of 160 cases.

The clinical picture is more or less typical of thyroid failure. The physical examination obtained confirms this. The general urine picture suggests either inadequate water ingestion or the possible loss of kidney permeability which has been observed by the writer in certain types of cases, notably thyroid depression. The sugar in the urine fails to harmonize, however, as hypothyroid cases show a tendency toward increased threshold of tolerance for carbohydrates. The nitrogen partition shows the high residual nitrogen fraction which the writer has observed in a number of disturbed endocrine states. The phthalein tests show lowered elimination although the hourly partition exhibits normal ratio. Beyond the slight leucocytosis, the blood morphology is not significant. The blood chemistry is normal although the uric acid is at the upper level of normalcy. Particularly significant is the normal blood sugar figure in view of the observed mellituria. The patient is 29 per cent. overweight and with a vital capacity somewhat lowered. The basal metabolism shows a positive lowering, associated with definite hypotension and a somewhat depressed heart rate. The magnitude of the patient's disability, if referable to the thyroid failure, would connote a greater depression in the basal metabolic rate than that observed. The writer has found that both the pituitary and the gonad may exercise a depressing influence on the basal metabolism, but that they both differ markedly in degree from the thyroid depression. Of the two possibilities, that of gonad failure is the more consistent with the other physical findings. When to this is added the fact that the patient has a lowered tolerance threshold, gonad failure becomes the only hypothesis consistent with the observed laboratory findings. Pituitary failure would produce a marked, thyroid failure a slight, increase in the threshold of tolerance. The failure of ovarian function, on the other hand, lowers the threshold in marked degree. The laboratory findings then warrant the establishment of a diagnosis of hypogonadism without thyroid involvement.

Many of the cases submitted do not furnish laboratory findings so sharply indicative as does the case cited above. A differentiation of endocrine from non-endocrine can be certainly effected, however.

In conclusion, the author wishes to express his basic indebtedness to the friends and colleagues through whose unreserved and ever-ready coöperation these studies have been made possible. To Drs. H. S. Babcock, T. E. Chandler, S. W. Ellsworth, S. C. Fuller, N. H. Garrick, S. B. Hooker, W. D. Rowland, H. Ulrich and, particularly, to the laboratory staff of the Evans Memorial is tendered the appreciative thanks of the author.

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ACTIVE IMMUNIZATION OF ADULTS AGAINST DIPHTHERIA

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The circumstance that we possess, regarding diphtheria, a larger and more completely developed body of knowledge than is the case with respect to any other infectious disease, might seem almost to require an explanation from new contributors, who can do little more than restate some features of an already enormous literature. All the methods necessary for highly successful combat against diphtheria are now in the hands of the medical profession in a stage of advanced, though not perfect, evolution and efficacy. Early diagnosis, detection of carriers and susceptibles, production of immediate passive and lasting active immunity, furnish adequate means for the reduction of morbidity and mortality to very low figures, yet statistical analyses set forth the unpalatable conclusion that these figures have continued on a high and virtually dead level for ten years; that diphtheria remains third on the list of communicable diseases and in the United States alone is annually responsible for some 200,000 cases, with upwards of 15,000 deaths, and an undetermined but large number of residual paralyses and weakened hearts.

The reasons for this condition of affairs are well understood; trustworthy remedial measures are readily available and easily applicable. The fundamental obstacle to the attainment of minimal case- and death-rates is recognized to be the sluggish diffusion rate of information. Widespread ignorance is directly responsible for widespread failure. The tremendous importance of education cannot be stressed too emphatically. Education, or disastrous experience, alone can impress upon the mothers the necessity of immediate medical aid in *all* cases of sore throat. Education, or disastrous experience, alone can bring home the insurance value of active immunization. The medical and nursing professions need also to be much more thor-

oughly permeated with those few but adequate principles which are solidly grounded on controlled laboratory and clinical evidence: the administration of an adequate dose of antitoxin at the earliest possible *minute;* the danger of waiting for and leaning too heavily upon a laboratory report; the abandonment of the subdermal in favor of the intramuscular or intravenous route for therapeutic injections, and other precepts which have repeatedly been dwelt upon.

Education of much the larger part of the public can be most effectively mediated by the family physician and by the nurse. Circulars, newspaper articles, public demonstrations are of considerable value, but they lack adequacy as means of bringing health education *home* unless reinforced by persevering *personal* insistence on the part of all private physicians, nurses, school authorities, and every informed individual or agency that has influence and the confidence of family heads. The truth and importance of this statement are readily demonstrable in any clinic for the immunization of pre-school children, by comparing the meager attendance when the district is only circularized, with the much larger attendance during a period when social service workers are making systematic home visits; also by noting the numbers referred by actively interested physicians as compared with the very few sent in by doctors whose inertia has not been overcome by an equal amount of distributed information.

The schools, of course, have afforded the best fields for testing and immunizing on a large scale. Although at least 80 per cent. of the deaths and a somewhat smaller proportion of the cases occur in children of pre-school age, work on the older group has a definite educational value and assists mightily in overcoming ignorance and distrust of the Schick test and of toxin-antitoxin prophylaxis among the population at large. But we must not lose sight of the fact that *if we wait until children go to school, out of every hundred that could have been saved by early immunization eighty are already dead!*

The prime desideratum, then, is to secure active immunity against diphtheria in every child before he reaches the age of two years. In striving toward this ideal, we repeat—at the risk of over-emphasis—that the personal influence of physician and nurse is the most forceful agency available.*

In familiarizing these professions with notable advances in diphtheria control it is not to be expected that the printed word will be so very much more efficacious than it is with the laity. This consideration has led us to attach a deal of importance to the educational value of intimate personal experience with the Schick test and active immunization of susceptibles which is afforded by the routine application of these procedures to students of medicine and nursing. Such instruction permeates and adheres; together with prevention of disease, with its attendant economic loss to individual and hospital, it constitutes ample justification for the active immunization of these young adults, which has been carried on in the Massachusetts Homoeopathic Hospital and in Boston University School of Medicine since 1917. The fact that a large number of the individuals herein reported upon have been closely associated with diphtheritic patients for weeks or months furnishes an exceptionally good opportunity to judge of the effectiveness of natural or artificially induced immunity, and adds interest to this communication.

*Those engaged in maternity work are in a peculiarly advantageous position to foster a parental resolve to have the newcomer immunized soon after he is six months old.

NATURAL IMMUNITY IN YOUNG ADULTS

The results obtained by Schick tests on 500 individuals are set forth in Table 1, which includes, for comparison, similar data published by other observers.

Susceptibility to diphtheria, as indicated by 60 per cent. of positive reactions, is high, but is concordant with the figures reported by Cooke, Garland, Mulsow, and White, who tested similar classes. The high adult immunity, 80 to 85 per cent., possessed by residents of New York City, affords a strong contrast. A large number of reports have established the fact that rural districts contain a much higher proportion of Schick positives than do urban communities; Boston, St. Louis and Chicago, whence issued the figures so consonant with our own, cannot be classed as rural on this criterion alone. The usual explanation of the relative lack of antitoxic immunity in such groups is that most of the individuals therein contained have but recently come to the cities after having resided for a number of years in more sparsely settled communities or in localities where the diphtheria rate approaches zero. A striking example of the influence of the latter factor has recently been reported by White. In one Massachusetts town there had been not a single case of diphtheria in twenty-five years; the Schick test applied to school children resulted in 100 per cent. of positive reactions. In another town there had been but one case during the same period; every test likewise showed a lack of antitoxic immunity. Certainly most of the evidence thus far accumulated favors the supposition that immunity develops as the result of unrecognized and minor infections with diphtheria bacilli, and among the permanent population in any given community it may be expected that the number of susceptibles will vary inversely with the case and carrier index. In all probability this explains the high number of Schick positives in the particular class of young adults under discussion, but a conclusion based on statistical control of such variables as race, location and duration of previous residence, morbidity rate, history of pre-

vious diphtheria in the individual, etc., has not been attained.

Sex.—Of the females in this series, 64 per cent. gave a positive reaction, which is one-third higher than the corresponding figure among the males. Numerically, the groups are too small to show definitely that immunity is more uncommon among females, but the ratio supports the idea that the better-protected group may be expected to contain more positive Schick reactors. The average age of the males was two or three years higher, but this fact does not explain the disparity.

Previous Diphtheria.—A considerably larger proportion of immunes was found among those who had previously had the disease. About 40 per cent., however, had not thereby developed any lasting antitoxic immunity. From the few data that are available in their historical records it would appear that a disproportionately large number of the immunes was found among those who had had diphtheria but who were *not* given antitoxin. This observation is in harmony with Zingher's similar but purposive investigation of the effect of simultaneous or closely spaced injections of antitoxin and toxin-antitoxin. It implies immunologically that early excessive neutralization of toxin (antitoxinogen) impedes or prevents the subsequent active formation of antibody by the infected or injected individual.

TABLE 1
Result of Schick Tests on Young Adults

	TOTAL	POSITIVE*		NEGATIVE*		COMBINED		PSEUDO		"PROTEIN" REACTORS	
		Number	Per cent	Number	Per cent	Number	Per cent of Pos'v's	Number	Per cent of Neg'vs	Number	Per cent
Nurses and Medical Students	500	299	60	201	40	59	20	102	50	161	32
Female	373	238	64	135	36	47	20	66	49	113	30
Male	127	61	48	66	52	12	20	36	55	48	38
Prev. Diphtheria	67	26	39	41	61	12	46	26	63	38	57
No Diphtheria	433	273	63	160	37	47	17	76	48	123	28
COOKE											
Nurses	147	86	58.5	61	41.5	17	20	23	38	40	27
GARLAND											
Nurses	350	195	56	155	44	25	13	73	47	98	28
MULSOW											
Nurses	97	65	67	32	33	...	...	...	...	...	...
Medical Students	40	27	66	13	34	...	...	...	...	...	...
WHITE											
Nurses	305	148	48.5	157	51.5	9	6	33	21	42	13.4
Total	1439	820	57	619	43	110	15	231	40	341	26

* Positive includes combined reactions. Negative includes pseudo-reactions.

ACTIVE IMMUNIZATION

The toxin-antitoxin used for immunizing the susceptibles has been the 3 L+ mixture furnished by the Antitoxin and Vaccine Laboratory of this Commonwealth; in only one small group was a 0.1 L+ mixture employed; the very first lot was obtained from the Department of Health of New York City.

Dosage and Reactions.—It was very soon brought forcefully to our attention that the three 1.0 ml. doses at weekly intervals which had been so well borne by children were tolerated poorly by these young adults, and an undesirably large number of severe local and annoying systemic reactions were reported. Loss of time, some disruption of hospital routine, and unpleasant personal inconvenience constituted factors which were scarcely to be regarded as conducive to popularization of toxin-antitoxin prophylaxis. It should not excite wonder that a nurse who had spent several days in bed, with dizziness, headache, backache, fever, and nausea, as a result of her injections of toxin-antitoxin, should be somewhat lukewarm in her enthusiasm for recommending the same treatment to others. Such temporary inconvenience may be held lightly by those who fix their eyes only on the goal of immunity to be attained, but it seemed that these reactions, although trivial in the abstract, were sufficiently impressive experiences to the individual and might obstruct one of our central purposes,—to make the nurse or student an important and urgent advocate of active immunization against diphtheria.

Persuaded, then, of the advisability of reducing the number of troublesome reactions, the dosage schedule has been so modified that the usual amounts now given are 0.2, 0.4, 0.6, 0.8 and 1.0 ml. The total dosage is unchanged, and as injections are made twice weekly the course is completed, as before, in two weeks. When toxin-antitoxin is administered in this way constitutional reactions occur in less than one of twenty individuals, whereas with high initial doses they

developed in at least 40 per cent. of those treated. When a marked local reaction is observed we consider it advisable to postpone any increase until the individual's response warrants a larger dose. Frequently six doses are given—the last four being 0.6 ml. Probably, among those who give marked local reactions, it is not necessary to administer the full 3 ml. in order to stimulate adequate antitoxin formation in the majority of such individuals. It has been done, however, in these series in order to keep the dosage factor constant. It is likewise probable that if a longer interval between doses were adopted a somewhat larger proportion of Schick negatives would result, since, in a group of school children who were given toxin-antitoxin with a lapse of two weeks between injections, Zingher observed that the percentage of immunes was greater than usual.

The constitutional and severe local reactions observed in adults occur *usually* in individuals who are "protein" sensitive as indicated by a combined reaction. There are frequent exceptions, however. Some combined reactors tolerate toxin-antitoxin very well, while some straight positives regularly exhibit systemic and local sequelae. The latter group seems to be made up chiefly of those whose Schick test is strongly positive. Sensitiveness to horse serum does not appear to be a factor, although urticaria has been noted in horse asthmatics following a dose of the mixture.

One medical student who had but a moderately positive toxin reaction, and was sensitive neither to heated toxin nor horse serum, repeatedly sustained marked constitutional reactions after injections of only 0.02 ml. of 3 L+ mixture. That amount diluted to 0.3 ml. or injected endermally evoked the same response, showing that concentration or rapidity of absorption was not a controlling factor. Tolerance was later built up so that 0.7 ml. caused no more than a slight local reaction. As a rule most people acquire this tolerance, so that later larger doses cause less trouble than the earlier, though smaller ones.

It is recommended that the initial dose, for persons whose hypersensitiveness to broth components is marked, be not in excess of 0.05 ml.—at least when 3 L+ or 1 L+ mixtures are employed.

RESULTS OF ACTIVE IMMUNIZATION

Schick Re-tests.—There are 171 who have received one complete series of immunizing injections and the re-test. Of the whole group, 75.4 per cent. became definitely immune; of the females 81.1, and of the males 59.1 per cent. These and other suggestive data are set forth in Table 2.

The figures are too small to permit of generalizations, but certain points are worthy of notice and perhaps of further study. A considerably larger proportion of combined reactors than of straight positives became immune. Among the females, particularly, toxin-antitoxin treatment has been followed by a distinct tendency (25 per cent.) to react to heated toxin, although the primary reaction was an uncomplicated positive. A change from combined to straight negative, instead of the expected pseudo, was noted in 4 of 26 instances. In the one case treatment has apparently exerted a sensitizing, and in the other a desensitizing, influence. It is very difficult, if not impossible, to interpret accurately the significance of the "protein" reactions observed in such a study as this which has extended over a period of several years, because, during that time, a number of lots of toxin have been used and the broth content, fluctuating directly with the m.l.d., has varied as much as 100 per cent. in some instances.

TABLE 2

Result of Toxin-antitoxin Injections

ORIGINAL REACTION	RE-TEST	NUMBER	PER CENT	PER CENT
TOTAL				
Positive 145	Positive	34	72.4	75.4
	Combined	6		
	Pseudo	22		
	Negative	83		
Combined 26	Combined	2	92.3	
	Pseudo	20		
	Negative	4		
FEMALE				
Positive 109	Positive	19	78	81.1
	Combined	5		
	Pseudo	22		
	Negative	63		
Combined 18	Pseudo	16	100	
	Negative	2		
MALE				
Positive 36	Positive	15	56	59.1
	Combined	1		
	Negative	20		
Combined 8	Combined	2	75	
	Pseudo	4		
	Negative	2		

Of positives, 72.4 per cent. became immune.
Of combined, 92.3 per cent. became immune.

Response to a Second Series of Toxin-antitoxin Injections.—There are 14 who have been retested after a second course of treatment, and all have become immune. In this connection, attention may be called to the immunizing effect of the Schick test dose of toxin. In several instances it has been noted that repeated testing, begun some six months after unsuccessful toxin-antitoxin injections, is followed by the development of an effective immunity. The writer, who formerly gave a moderately positive reaction and made use of it to control the potency of various lots of toxin, now, after seven or eight tests, responds negatively. Analogous observa-

tions have recently been made on animals by Glenny *et al.* in England.

TABLE 3

Reactions from Toxin-antitoxin Injections Correlated with Subsequent Development of Immunity

SCHICK TEST	REACTION	RE-TEST	PER CENT
	Systemic 26	Pos. 3 Neg. 23	11.5 88.5
Positive 144	Marked Local 25	Pos. 7 Neg. 18	28 72
	Slight or None 93	Pos. 28 Neg. 65	30 70
	Systemic 15	Neg. 15	100
Combined 25	Marked Local 4	Neg. 4	100
	Slight or None 6	Pos. 2 Neg. 4	33 67
	Systemic 41	Pos. 3 Neg. 38	92.7
Total 169	Marked Local 29	Pos. 7 Neg. 22	76
	Slight or None 99	Pos. 30 Neg. 69	70

Relation of Local and Systemic Reactions to the Development of Immunity.—The figures analyzed in Table 3 are discussed under this heading, but it is by no means clearly demonstrable that the degree of reaction following toxin-antitoxin injections is the sole determinant of the directly increasing proportion of subjects who become immune. Three other variables must be controlled in a more extensive study: (1) those who gave marked local or systemic reactions received a larger number of doses than the others; (2) the injections were continued over a longer period, and (3) the intensity of the Schick reaction, or the amount of natural antitoxin already present, must be considered. Each of these factors undoubtedly is accountable in some measure for the better results eventually obtained among those who were less tolerant of the usual toxin-antitoxin dosage.

Clinical Diphtheria among Those Tested and Immunized.—The final criterion by which the efficacy of methods of diphtheria prevention is to be judged has been met by recording the occurrence of the disease among those who have been brought into prolonged and intimate contact with it in an associated contagious hospital.

Prior to the institution of these methods in 1917, during a period of ten years at the Haynes Memorial there were 55 cases of diphtheria among some 265 nurses—an incidence of 21 per cent., which may be compared with the 28.6 per cent. reported from St. Louis by Cooke. Since we have been active in protecting the susceptibles before they are allowed to go on the contagious service, there have been, among 270 tested nurses and during six years, only five cases in which clinical diphtheria has been diagnosed with reasonable certainty. In three of these, all originally Schick positive, the disease developed before a re-test was made; in the first in less than one month after treatment, in the second in four and one-half months, and in the third in less than two months after having received a single 1.0 ml. dose. It is well known, of course, that the immunity response to toxin-antitoxin is fairly slow and that quite a few individuals do not become Schick-negative till six or more months have elapsed. The fourth case was in a pseudo-reactor, and the most obvious explanation is that the reaction may really have been a "combined-postitive." In the fifth instance the primary test was frankly negative, the disease ran a mild course, and, depending upon one's viewpoint, this apparent failure may be ascribed to faulty technique in performing the test, or the individual may actually have been an immune carrier with a sore throat caused by some other microörganism. Be that as it may, there are only two possible mistakes to be charged up against us and these make the diphtheria incidence only 0.74 per cent. in the whole tested group—a reduction of 96.5 per cent.

Non-immunized affiliated nurses continue to develop diphtheria in about the expected proportion of individuals.

Only a fraction, perhaps one-third of Schick positives contract diphtheria, even after prolonged exposure. Presumably the resistant group possesses an antibacterial, as opposed to antitoxic, immunity, but concerning this important factor we know almost nothing.

THE DEVELOPMENT OF HYPERSENSITIVENESS TO HORSE SERUM

At the time of the primary test for susceptibility to diphtheria, an endermal injection of 0.05 ml. of 1:10 whole horse serum was made with the purpose of determining whether serum hypersensitiveness might be a factor in the development of reactions to toxin-antitoxin, and whether the tiny amount of serum contained in the mixture were capable of producing an allergic condition. In respect to the first point, it may be said at once that our experience indicates a positive skin reaction to horse serum to be in no way a contraindication to the use of toxin-antitoxin, since we have been quite unable to show any relation between the presence of such hypersensitiveness and the occurrence of noteworthy post-injection reactions. Concerning the subsequent development of hypersensitiveness, however, positive findings have been recorded. This interesting phenomenon is discussed at some length in a forthcoming number of the *Journal of Immunology* and will be given less detailed treatment here.

Excluding all subjects who had previously

been treated with horse serum, there were 307 who responded negatively to the primary test, 11 (3.1 per cent.) who gave an "immediate" positive reaction, and 38 (10.6 per cent.) who gave a "delayed" positive. The immediate reaction is characterized by the development in ten or fifteen minutes, of the familiar wheal, with an erythematous surrounding zone and more or less itching. The delayed reaction, described by Moss, appears in two to forty-eight hours as a patch of redness and edema with a variable degree of itching; wheal formation is observed in about one-seventh of these reactions.

Of the 307 primarily negative reactors there are now 155 who have been again tested about six months subsequent to their last toxin-antitoxin injections. Forty-two (27.1 per cent.) gave the immediate type of reaction to horse serum, 58 (37.4 per cent.) the delayed type, and the remaining 55 (35.5 per cent.) were still negative.

All of the originally serum-positive individuals who were immunized with toxin-antitoxin have remained positive, and a number of them have apparently become more sensitive because their primary delayed reactions had, on re-test, been converted into the immediate type.

It will come as a distinct surprise to many that quantities of horse serum so small as 0.015 ml.—the largest total administered to any subject—are able frequently to induce a condition of allergy in human beings. It is considered, on reasoning detailed elsewhere, that, although both the test and treatment doses of serum protein are operative in sensitizing, the test dose probably plays a less effective part. Some unpublished studies on children by Park indicate that, as would naturally be expected, immunization with 0.1 L+ mixtures—containing about one-thirtieth the amount of serum present in 3. L+ lots—does not sensitize as large a proportion.

These observations are presented in full cognizance of the unfortunate circumstance that many clinicians awesomely regard serum "anaphylaxis" as a spectral phenomenon whose presence automatically and unquestionably interdicts any recourse to serum treatment. There are the best of reasons why such an attitude should be abandoned. Fatal serum shock is *rarissima avis*—so extremely uncommon as to be a medical curiosity. Withholding indicated serum therapy would cause hundreds of times more deaths than would even its careless administration to artificially sensitized patients. Diphtheria antitoxin is by far the most frequently used form of serum treatment and will never be needed by the vast majority of these individuals sensitized by toxin-antitoxin. There is no reason for alarm even if horse serum hypersensitiveness should become very common, which need not be the case, because it is perfectly feasible to employ in toxin-antitoxin mixtures an immune serum derived from some other animal, and which does not cross-sensitize to horse serum. There is no evidence that the delayed type of reaction has any salient clinical significance.

On the other hand, we feel, personally, that any appreciable increase in the number of immediate positive skin reactions will prove prejudicial to the best interests of serum therapeutics in general. The following considerations may seem, singly, to be of minor import, but together they are deemed greatly to outweigh the almost negligible burden of maintaining a separate species of animal by producers of toxin-antitoxin.

It must be admitted that many individuals who give an immediate positive skin reaction to horse serum will probably experience no more than an accelerated form of serum sickness, but in the long run this group will develop more undesirable symptoms following serum treatment than will an equal number of insusceptibles. Not infrequently are these symptoms sufficiently abrupt and impressive to inspire a mistrustful and over-cautious attitude on the part of the patient, his relatives, friends, and sometimes his physician, in regard to the safety of serum treatment. Inasmuch as employment of the most effective route of injection—the intravenous*—is most likely to be followed by sudden unpleasant reactions not a few physicians are and will be prone to use a route that permits less speedy absorption and distribution of antibody. Thus is violated one of the basic principles of effective serum treatment—early and rapid protection against the infecting agent and its products. This principle is further transgressed by the delay attendant upon desensitizing methods, and these methods result in a drain upon the valuable time of trained physicians. Another point, perhaps worthy only of mention, is that heterologous serum (and antibody) is more rapidly eliminated by the specifically hypersensitive than by the normal organism; thus may the duration of passive immunity be appreciably shortened.

We submit, then, that any measure which tends to diminish immediate reactions of serum hypersensitiveness, general or endermic, will operate to extend, or at least to prevent restriction of, the field of usefulness of passive therapeutic immunization. Until there is generally available an adequate variety of specific serum-free antibody solutions, or until serum-free diphtheria "toxoid" is perfected for the active immunization of human beings it seems warrantable to recommend that some animal other than the horse be selected for production of the antitoxin destined for use in toxin-antitoxin mixtures. The goat probably will be suitable for this purpose.

*The diseases calling for serum treatment which are most likely to occur among those immune to diphtheria are pneumonia and meningitis, in which, at present, serum is most effective when used by the intravenous or subarachnoid route.

SUMMARY

Systematic application of the Schick test and toxin-antitoxin immunization of susceptibles are procedures highly effective in the control of diphtheria among young adults who are later brought into close and prolonged contact with the disease. It is felt that actual personal experience with these methods is a forceful educational stimulus to these nurses and medical students who naturally occupy such advantageous strategical points in the diphtheria prevention campaign; their indispensable advocacy is thus rendered more intelligent and effective.

About 60 per cent. of this class of individuals are susceptible to diphtheria. One series of toxin-antitoxin injections immunizes three-fourths of them. A second series administered to those who remain Schick positive is at least equally effective. The systemic reactions which adults are prone to experience under the usual toxin-antitoxin dosage schedule can be greatly reduced, with no apparent lessening of antitoxin production, by using the local reaction as a guide to dosage increase; as a rule a gradient of 0.2, 0.4, 0.6, 0.8, and 1.0 ml. can be followed. A considerable number of the subjects become hypersensitive to horse serum as a result of toxin-antitoxin injections and endermal serum tests. This is deemed undesirable and can be avoided by substituting goat antitoxin for the horse antitoxin now used in the mixtures.

Clinical diphtheria among members of the tested group has been reduced over 95 per cent.

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THE WASSERMANN TEST AS A CRITERION OF CURE FOR SYPHILIS

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The Wassermann test has become so strongly intrenched in medical thought as the sole guide for the treatment of syphilis that a reminder that the reaction signifies only an immunological response on the part of the patient, variable in strength and nonspecific in character, may not be out of place. It seems wise to consider more fully the relation of this reaction of the blood serum to treated and untreated syphilis before accepting it unreservedly as a criterion of cure.

Syphilitic Cure.—From Wassermann surveys and other evidence it appears that about 9 per cent. of the adult population has syphilis in some form, the percentage naturally varying with social classes, sections of the country, and race and nationality. A relatively small proportion of this large number die from recognized syphilis, which in 1920 constituted 1.3 per cent. of the general death rate and 2.3 per cent. of the rate between the ages of 24 and 64. The percentage method of Osler, as applied to the mortality statistics for 1920 for persons over one year old, shows syphilis as a factor in 6 per cent. Autopsy findings indicate an even greater prevalence of the disease. Statistics show that although the proportion of syphilitics among hospital patients is twice that in the normal population, in reality less than 1 per cent. of the entire population of the United States receive hospital care directly because of syphilis. From these statistical impressions it is evident that an appreciable number of syphilitics acquire naturally a complete or partial immunity, which, if not entirely eradicating the disease, at least keeps it in a state of inactivity. Patients may have old anatomical lesions, occasionally give a positive luetin or possibly a positive Wassermann test, and yet the disease may have reached a state of temporary cure, while in a still smaller number any or all of these signs may have disappeared.

Early cases of syphilis, because of the possibility of sterilization, and old syphilities with active lesions, which indicate the inability of natural resistance to cope with the infective process, require treatment. The term "treatment" as used in this paper is limited to drug therapy. Some latent cases need treatment, others do not; but physicians are not yet competent to decide which may safely be left untreated. Treated cases comprise three classes: (1) those who recover naturally without or in spite of treatment, (2) those who respond to treatment, and (3) a small number who in spite of thorough treatment because of low resistance or susceptibility succumb to the disease. Sterilization by means of treponemicidal chemico-therapy appears most effective in early syphilis. In late syphilis the healing of the pathological lesions and the reduction of the disease to an inactive state are the most that can be expected.

A comprehensive definition should include cure through the natural defensive mechanism of the patient and through drug therapy. So indefinite and complex a subject defies limitation within the narrow scope of any arbitrary rules; yet for a working basis it is necessary to formu-

late certain principles. Permanent cure can be obtained only by the eradication of the treponema from the body. All other cures, natural or artificial, while practically permanent, necessarily must be temporary, inasmuch as a potential focus of infection, as in tuberculosis, may remain. A temporary cure demands: (1) the elimination of all active symptoms or lesions, (2) the healing in so far as possible of old anatomical lesions, and (3) the reduction of the disease to a latent condition through the immunity of the patient or the loss of virulence of the infecting organism.

THE WASSERMANN REACTION IN UNTREATED SYPHILIS

The Wassermann test is a laboratory procedure for the detection of certain substances, collectively designated for convenience the Wassermann antibody, which have been produced by an immunological reaction to syphilis on the part of the patient. Although practically diagnostic of the disease the reaction is not strictly specific since the antigen used for the detection of the Wassermann antibody, unlike bacterial antigens, is not directly connected with the causative organism. The nonspecificity of the antigen permits the occasional occurrence of nonsyphilitic fixation, and to some extent discredits the reliability of the test, although, except in febrile, toxic or pregnant patients and those with spirochaetal diseases, the possibility is most remote. The reaction, which depends upon the presence of the Wassermann antibody and the delicacy of the mechanism of detection, varies with the laboratory technique, the stage of the disease and the individual response of the patient.

Laboratory Variation.—Technical difficulties prevent absolute certainty in detecting the Wassermann antibody. Miscellaneous antigens of low potency, careless technique, incorrect determination of the fixing unit of complement and an arbitrary standard of serum volume explain many negative reactions in clinical syphilitics. Statistics merely indicate the presence or absence of detectable quantities of antibody in 0.2 c.c. of serum (original Wassermann volume) subject to these technical variations. More exact information may be obtained by using increased amounts of serum for the detection of small quantities of antibody and by measuring the strength of the positive reactions. The measurements in this paper are expressed in arbitrary units according to the titration of serum, complete fixation with 0.2 c.c. having the value of 4. On this basis, fixation with 0.1 c.c. would have a value of 8, 0.05 c.c. 16, etc. Laboratory variation may be demonstrated by comparing the results of two large laboratories with a preserved serum of 32 unit strength over a period of several months. For the most part uniform results were obtained, but at times wide discrepancies were observed. On one day the first laboratory might obtain a value of 8 and the second 32 or 64, and on another these figures would be reversed. The daily variation in the fixing unit of complement appears to be the most prominent factor in the production of this condition and in itself is sufficient to explain discrepancies in reports on weakly positive sera.

Clinical Syphilis.—The accompanying table shows the percentage of positive tests, as compiled by Craig,[1] and the average strength of the Wassermann antibody[2] in various stages of syphilis. In general the two follow a parallel course roughly comparable, except in neurosyphilis, to the clinical progress of the disease. During the very early stages the Wassermann antibody is absent or weak, rapidly increasing in strength until it reaches a maximum during the late secondary or early active tertiary stages and then gradually falling as the disease becomes quiescent. Owing to the impossibility of detecting all the so-called naturally cured cases, the relative frequency of positive reactions cannot be determined; but in those cases which occasionally come to light the reaction as a rule is weak.

WASSERMANN REACTION IN CLINICAL SYPHILIS

Stage of Syphilis	Per Cent. Positive	Average Strength of Wassermann Antibody in Units
Late Primary	89.8	14
Secondary	96.1	23
Tertiary		
Active		30
Inactive		11
Total	87.4	20
Neuro	68.1	12
Latent	68.1	7
Congenital	82.2	46

Individual Variation.—The greatest source of variation in the production of the Wassermann antibody is the individual. The relation of this antibody to his resistance, or to the severity of the disease, is problematical, although the active disease apparently calls forth a stronger reaction than the latent. Changes from a strong positive to a negative sometimes unexpectedly occur with or without treatment, and are entirely different from the daily fluctuations reported by certain observers, which are chiefly due to technical causes. A negative reaction is not infrequently found in clinical syphilis and commonly in patients with a definite history of syphilis of several years standing but without evidence of active lesions. These so-called negative patients fall into two classes: (1) those who give a positive reaction on repeated tests with two or four times the usual volume of serum, and (2) those who show no detectable antibody with such repeated tests even when allowance

[1]Craig, C. F., The Wassermann Test, 1921, p. 159, C. V. Mosby Co., St. Louis.

[2]Our preliminary measurements with cholesterolized antigens and water bath fixation.

is made for natural antisheep hemolysin. The majority fall within the first group and comprise old patients in whom the Wassermann antibody has become so weak that it cannot be detected by the ordinary test.

THE WASSERMANN REACTION IN TREATED SYPHILIS

In untreated syphilis the Wassermann reaction is subject to two variables, the response of the patient and the course of the infection. Treatment produces additional complications, since the effect of the drug on the disease, on the individual patient, and on the antibody, has to be considered. Particularly when several drugs are used the problem becomes so perplexing that only the effect and not the mechanism of production can be determined. Results indicate that in the average case treatment tends to produce a negative reaction as well as clinical improvement, but that the two do not always coincide, the reaction in many old syphilities persisting for a variable time after the disappearance of clinical symptoms. Furthermore, the result depends upon the type of antisyphilitic drug, the stage of the disease and the response of the individual patient to treatment.

Drug Therapy.—Arsphenamine produces a reduction of the Wassermann antibody, which so far as can be determined is permanent in the average case. The immediate reduction depends upon the dose, rate of administration and individual response of the patient, its permanence upon the exacerbations of the disease. The reduction does not entirely depend upon the amount or length of treatment. It does not always occur coincidently with the decline of the clinical symptoms and at times reaches its minimum one to two months after treatment.

The various compounds of mercury differ little in serological effect, provided that the patient is carried to the point of physiological toleration. At least 1 mgm. of metallic mercury per kilogram of body weight per week is necessary to reduce materially the reaction in old syphilitics. The reaction falls during treatment, reaches its minimum at the close and shows a characteristic partial recovery during the next few months.

Stage of the Disease.—In early syphilis the reduction of the Wassermann antibody is readily produced, but its disappearance is not synonymous with the elimination of the treponema from the body. In late syphilis, in spite of a lower antibody content of the blood serum, the reduction of the strength of the reaction and the production of a negative are more difficult and require more treatment.

Individual Response.—Some patients tolerate an appreciable quantity of arsphenamine or mercury, others are sensitive to one or both drugs. This intolerance is unfortunate since the average patient requires appreciable doses to reduce the Wassermann antibody. Some patients require little treatment to attain temporary cure and a negative reaction, while others in spite of thorough treatment show partial or no reduction in antibody titre. Still others may show clinical improvement and no corresponding change in the Wassermann antibody.

THE CRITERION OF CURE

The Wassermann reaction in both treated and untreated syphilis represents an immunological response on the part of the patient, which is distinct from the clinical course of the disease. In the average case clinical syphilis and the reaction run a parallel course, but in the individual patient the reaction may or may not be comparable to the clinical findings. Although an index of the response of the patient it furnishes no absolute measurement of his resistance or of the activity of the disease. Provided allowance is made for the unsatisfactory negative, the reaction of the blood serum is of value for diagnosis but as a criterion of cure it has limitations.

Negative Reactions.—As untreated syphilis becomes chronic or quiescent, the Wassermann reaction tends to become negative. Treatment accelerates this process. The Wassermann test is not sufficiently delicate to show the complete elimination of the antibody from the blood serum and only furnishes evidence that it has fallen below a certain standard. In early syphilis treatment rapidly reduces the antibody below this figure, but many instances of the recurrence of clinical syphilis in insufficiently treated cases testify that such a negative is not a proof of cure. Likewise, clinical syphilis is not uncommon in patients with negative reactions. The use of increased amounts of serum in the test, if properly controlled, will reduce materially the number of pseudonegatives, but even this refinement will not permit the test to serve as a criterion of cure.

Positive Reactions.—The ordinary Wassermann test, which merely records the narrow range between a strongly positive and a negative reaction, is less satisfactory than the quantitative test, which gives the titrated strength of the antibody. In untreated cases this additional information may be of prognostic value and a high titre antibody in old syphilitics may indicate an unsuspected visceral or vascular involvement. In treated cases it is an index of the earliest serological response to treatment and as such serves as a guide for drug therapy.

Not infrequently patients in spite of thorough and prolonged treatment maintain a persistent positive reaction. The Wassermann-fast patient under treatment either shows no change in the strength of the reaction or gives a partial reduction, which never reaches a negative. Certain patients who are resistant to one drug may yield a negative reaction when treated with another, others seem resistant to all forms of medication. Patients with visceral and vascular syphilis are

particularly resistant to treatment. The average patient with a persistent positive reaction is more likely to have an unsuspected focus of infection or show a recurrence of the disease than one with a negative reaction. However, in certain patients a persistent positive may not indicate prolonged treatment, particularly since theoretically it is possible for the reaction to persist after the disease has reached the quiescent state of temporary cure.

In connection with negative clinical findings and thorough treatment a negative Wassermann reaction is of corroborative value in determining temporary cure. By itself the negative reaction does not indicate the cessation of treatment and a persistent positive may not always call for further treatment. The quantitative positive reaction is a valuable guide to drug therapy and an aid in diagnosis, but the Wassermann reaction of the blood serum is not a criterion of cure for syphilis and in this respect is inferior to a complete serological examination of the blood and spinal fluid.

FACTORS, ACTUAL AND POSSIBLE, IN CARDIAC NUTRITION*

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Ever since Jenner's correct interpretation of John Hunter's fatal malady† the blood supply to the heart has remained a topic of profound interest. The heart, endowed with uniquely automatic power, pays a high price therefor; it must feed itself or cease to beat. Its vessels are the "arteries of sudden death."

I purpose to summarize some of the structural and mechanical factors of cardiac nutrition, and to present several considerations perhaps not before brought into relation. My title indicates a treatment in part frankly speculative. Yet such discussion need not be futile, for a suggestion unworthy to rank as an hypothesis may in the end serve to evolve trains of thought ripe for experiment.

The topic bears, in the first place, upon the recurring problem of how hearts can remain so long functionally immune with their coronary vessels impeded, even with total occlusion of important branches. One is tempted to think that the question does not concern the coronary arteries alone, but that a heart struggling to gain subsistence through abruptly or increasingly blockaded primary channels must in some significant degree have recourse to subsidiary sources. In the second place, viewing the evident jeopardy involved in restricted vascular fields, why has the heart not been endowed with unimpeachably free anastomoses, or even a "circle of Willis"?

THE NUTRIENT STREAMS

The streams of nutriment passing through the heart are conceivably four in number: first, the coronary stream; secondly, the pulmo-systemic stream; third, the sinusoidal stream; and fourth, the lymphatic stream.

The Coronary Stream.—This is readily shown to be the mainstay of the heart's activity. Ligation or plugging of one of the coronary arteries in an animal, if not followed promptly by standstill or fibrillation,[1] is liable to produce such disturbances as extrasystole or paroxysmal tachycardia.[2, 9] On the other hand, an excised heart or, as in Porter's[3] crucial experiment, even the fragment of a ventricle, may be made to beat evenly and forcibly by perfusion of its vessels with warm blood.

Nevertheless, the attempt to derange the heart by artificial closure of a coronary branch frequently fails,[1, 4] as the attempt of nature in disease so often fails,* to bring about immediate or even early disturbance of function. Hence a controversy has long existed over the question of collateral circulation. The older anatomists describe a free anastomosis between the two coronaries. Cohnheim swings opinion to the opposite extreme by his dictum that the coronaries are physiological end-arteries, each having no functional jurisdiction over the nutritive territory of the other. And ever and again do we find the problem newly committed to the balance through data admitting of divergent interpretation.

The problem is not so easy of approach as might seem. Anyone who has attempted to inject one member of the coronary system with a mass just held back by capillaries knows how highly reluctant it is to encroach on the domain of its neighbor. Yet, finer masses may pass with ease, and even the coarser occasionally; there is no question of anastomosis in an anatomical sense. But this connection can hardly be regarded as generally free, if we compare the extent of freedom with that found in other vascular fields commonly termed anastomotic.

In 1907 Jamin and Merkel[5] published a set of very beautiful stereo-radiographs of human hearts injected with a gelatinous suspension of red-lead. Unaided inspection reveals apparently frequent anastomosis between branches of right and left coronaries. But the appearance is far less convincing when one gains the three-dimensional impression with the stereoscope. This defect is general where Roentgen-ray shadows of injected vessels are examined in two dimensions. As Crainicianu[6] remarks, in connection with his own injections of similar char-

*An outline of the main points here considered was read before the Medical Alumni Association, University of Buffalo, May 30, 1916.

†See Osler's opening lecture, "Angina Pectoris and Allied States," N. Y., 1897, D. Appleton & Co.

*Herrick[22] presents an impressive series of cases in which rapidly obstructive coronary events, often associated with angina, have failed to cause immediate death or have even permitted of recovery.

acter, the picture resembles that of a leafless tree seen in the distance, its branches apparently richly inter-connecting. However, with all proper precautions in interpretation, these and other studies[7, 8, 9] seem to establish firmly the fact of anastomosis. Especially convincing are the recent results of Gross,[10] who has shown in a series of injected human hearts, made transparent with a volatile oil, a very rich anastomotic condition *becoming more marked in successive decades of age.* This must be regarded as the most complete proof of the inter-communication of coronary arteries and their branches that yet exists.

It is difficult, nevertheless, not to feel that we are here dealing with a structural rather than a functional conception. The ease with which the heart may be stopped by ligation, the occurrence of infarcts, experimental[11, 4] and clinical,[12] and the generally hopeless results which follow acute embolism and thrombosis, seem sufficient to cast grave doubt upon the general efficacy of any collateral circulation that may be available.

The Pulmo-Systemic Stream.—The heart is a modified vessel transmitting the great mainstream of the body. Like all massive vessels it has its *vasa vasorum,* the coronary arteries. Many vessels, however, lack such intrinsic channels, and hence must receive their nutriment through their intima as well as from sources in the enveloping tissue. Is it not conceivable that the heart, especially in its thinner-walled chambers, profits to an appreciable extent by the richly laden nutritive stream swiftly entering and leaving its cavities? Mesothelial and endothelial surfaces have great absorptive power. Thus the endocardium exposed to the swifter currents may be of significance as a membrane permeable to oxygen and nutrients. That it is such for its more sequestered regions is suggested by the factors now to be considered.

The Sinusoidal Stream.—As a side current of the mainstream there exists in the heart the less hurried sinusoidal stream. The concept of sinusoids, as developed by Minot,[13] differs from that of other blood channels in that, whereas during development the typical vessel grows out to a tissue and applies its capillary network to it, sinusoids, on the other hand, are made by the invasion of a vessel by ramifying masses of tissue, carrying intima before them and thus filling the lumen with irregular, branching, inter-communicating channels.

The amphibian heart—in fact, the heart of air-breathing lower vertebrates in general—has virtually no coronary arteries, although in the fishes[14] and larval forms of amphibia[15] the wholly venous heart has a superficial coronary supply from the branchial vessels. In all these forms the myocardium is permeated by nutritive sinusoids in communication with the systemic blood. The blood largely leaves the sponge-work in systole, and the ventricle pales, returning to its deep red hue during the diastolic filling.

Now the embryonic mammalian heart, like the adult heart of the lower vertebrates, is not a cavity surrounded by discrete walls, but a sponge-work of sinusoids. The lumen of what is at first a smooth vessel becomes involved in the irregular mass of muscle which represents the labyrinthine blood-filled wall of the fish and batrachian heart; retrograding later, however, to form the columnae carneae, trabeculae, and papillary muscles of the mammalian fetus. The embryonic sinusoids of the mammalian heart, according to F. T. Lewis,[16] persist not only as the crannies among the trabeculae of auricle and ventricle, but even penetrate the muscular masses in the guise of the so-called Thebesian vessels, or *venae cordis minimae.* The latter, according to Parker and Davis,[14] have their homologue in fishes. At least part of the Thebesian system, communicating eventually with coronary veins,[14, 17] Lewis views as a vestige of the embryonic sinusoids.

It has been shown by the writer[17] that if the right ventricle of the excised cat's heart be filled with warm defibrinated blood under very slight pressure—treated, that is, as if its early sinusoidal channels were still of nutritive significance—the part of the heart thus distended will perform vigorous rhythmic contractions, and the coronary veins will be found to contain blood derived from the ventricular contents. Too much must not be inferred from such a demonstration, for the heart is working against practically no resistance. But it has this significance,—that a developed mammalian heart does retain to some extent its ability to profit by nutriment fed by the surge of the mainstream to the quieter paludal areas. The deeply trabeculated character of the atrial and ventricular inner walls, together with the numerous Thebesian openings into the muscular mass, combine to render this a factor not to be overlooked in the heart whose ports of supply are acutely or progressively closed.

Perfusion experiments on fresh human hearts, made recently by Crainicianu,[6] indicate a far greater communication between coronary vessels and heart-cavities than has been supposed. On the introduction of a saline perfusion fluid into the coronary arteries under a normal pressure (not over 120 mm. Hg) the outflow from the coronary sinus was only about 4 per cent. of the total fluid recovered, the greater part issuing from the heart-cavities. If this paradoxical result is substantiated it must, as Crainicianu points out, strengthen the possibility of entrance of blood from cavities to coronary capillaries whenever, as in coronary occlusion, the pressure in a cardiac vascular area is greatly lowered.

The Lymphatic Stream.—On the lymphatic stream of the heart, physiology is silent. The lymphatics form right and left, both deep and

superficial, networks in the myocardium.[18] The endocardium, as may be impressively demonstrated in the ox by air-inflation, is underlaid by a rich lymphatic plexus. Every muscle is a lymphatic pump. The heart must be particularly effective in removing through these channels such fluid material as is not cared for by the coronary veins. The possible relation of the lymphatic stream to nutrition gained, as has been discussed, through the endocardium, clearly invites investigation.

A DIFFERENTIAL SIGNIFICANCE

That the coronary arteries are virtually terminal, in a physiological sense, may be of very great significance. It seems as if there must be some good "reason" for this delimitation of their areas. A thoroughly developed coronary system is apparently characteristic only of the two-chambered ventricle, the single ventricle of the lower vertebrates being, as above indicated, in main measure nourished from the sinusoidal spaces. Little is known of the heart's vasomotor control. That a relative or virtual confinement of coronary arborizations to their own domain may favor differential influence over the two sides of the heart, so varying in their several demands, through a delicate adjustment of nutritional factors, seems a possibility worthy of emphasis. The intricately wound and woven fabric of the myocardium gives to each ventricle a more or less discrete wall. If, as already noted,[17] the excised heart is allowed to contain blood in one ventricle only, that ventricle alone will beat. By occluding the flow in a coronary artery, the ventricle fed by that artery will sometimes cease beating while that of the opposite side continues its rhythm. This effect was noticed in several instances by Miller and Matthews (4, pp. 480-481) on ligating branches of the left coronary. It indicates, as does the experiment in sinusoidal nutrition, a capability of the myocardium to respond in part as it is in part nourished. The nodes and conducting system, moreover, lie in potentially restricted vascular areas. According to Haas[19] the conducting system receives, in man, its coronary supply from the right artery—in the dog, from the left.

Data such as the above suggest a mechanism capable of varied function through local nutritive conditions. It is true that although the energy of heartbeat is altered by coronary flow, the *rate* is not.[20] For this Wiggers[21] offers the significant explanation that, for the auricle, the blood in its cavity is of more moment nutritionally than are the coronary tributaries. Since the tensional degree to which the cardiac musculature responds is a function of coronary supply, the maintenance or alteration of cardiac output must hinge very delicately on coronary factors, as well as on conditions furnished by the venous intake. Thus we may conceive of the right atrium, with its associated pacemaker, as chemically governed, in part at least, by the content of fresh venous blood; the ventricles, on the other hand, as being capable of differential response to conducted influence entering tissue differentially adjusted by coronary-arterial (vasomotor?) circumstances. Such is the picture rendered credible if anastomoses in the myocardium are not too free to enable pressure-differences to exist in the several coronary precincts*—differences which would represent local control by coronary branches over excitability and conduction, as well as over magnitude of response.

If, on the contrary, a true collateral circulation were an advantage to the individual, especially in the physical crises of life, the establishment of free anastomoses would be expected as an outcome long since of racial adaptation. It is significant that the heart in youth—in the period when it is most subjected to the stress of environment and is most adaptable to stress—has, as Gross[10] has shown, less freedom of collateral supply than in age. The heart of age is fortified, not against the vicissitudes of life, but against the more insidious forerunners of dissolution.

SUMMARY

The mutual dependence of heart beat and heart nutrition makes all possible sources of the latter of prime clinical interest.

Modes of nutrition to the heart have four conceivable origins:

1. The *coronary stream*, yielding the vastly preponderating nutrient supply. The heart may, however, survive grave impairment of this supply, in spite of the relative tendency of the vessels to be functionally terminal. Other nutrient factors may thus possibly supervene to prolong function, such as:
2. The *pulmo-systemic stream*, passing, nutrition-laden, over endothelial, and thus probably highly absorptive, surfaces.
3. The *sinusoidal stream*, a diverted portion of the above, bathing the walls of the vestigial sinusoids (trabecular clefts and Thebesian openings) and known to be capable under experimental conditions of imparting a certain quota of nutriment to the myocardium.
4. The *lymphatic stream*, of problematical significance in the heart, yet undoubtedly an active distributor of material such as might be absorbed from the heart-cavities.

The relative difficulty of collateral circulation (owing to narrow communications of high resistance), in connection with the several coronary territories, suggests that demarcation of nutritive supply may serve in a differential capacity, enabling the circulation in one ven-

*Baumgarten[21] found, 36 hours after ligation of the right coronary in the dog, complete infarction in the presence of an anastomotic connection with the left coronary 0.7 mm. in diameter (p. 256).

tricle, for example, to exercise a selective control over that particular chamber. Moreover, a free anastomosis between the coronary arteries, if of advantage to the active and adaptable heart, would be expected to have become long since established as a conspicuous racial character. As evidence goes, however, the more freely anastomotic heart is not that of youth, but of age.

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STUDIES IN ENDOCRINOLOGY

I

Hypothyroidism with and without Myxedema

BY CHARLES H. LAWRENCE, M.D., BOSTON

[From the Evans Memorial]

The following article is based on the study of twenty-five cases of hypothyroidism, on which clinical and laboratory investigations have been made at the Evans Memorial.

The purpose of these studies was, first, to determine what tests were most valuable from a diagnostic point of view; and second, to correlate the clinical symptoms with the laboratory findings.

The various tests were performed under the direction of Dr. Allan W. Rowe, to whom I am indebted for the use of the results obtained. The histories and physical examinations were made by me, or by the house officer at the Evans Memorial.

A description of the various tests used has been published by Dr. Rowe[1]; the results alone are discussed in this paper. These results are given in detail in Table 1, and summarized in Table 2. The summary brings out clearly the effect of thyroid failure upon metabolism, but the detailed findings are recorded because there does not appear to be any record in the literature of an equal number of cases so studied.

The cases included in this series were all adults, since there exist no satisfactory normal figures for many of the tests as applied to growing individuals. There is, therefore, nothing particularly significant in the age figures for the series. The youngest was twenty-one years, the oldest sixty-one years, the average just below thirty-eight years. This figure coincides with Dock's[2] observation.

The figures as to sex are more significant. There were twenty-one females and but four males in the series. This ratio agrees with those of Dock[2] and Biedl.[3] It is not known why females are affected so much more frequently than males, and the explanations thus far advanced are purely theoretical. The fact that the female predominance is much greater after puberty than before, MacKenzie[4] suggests that the interrelation of thyroid and ovary is a factor.

In an attempt to clear up the question of female predominance, careful search was made for the probable etiology of the thyroid failure in every case in this series. In only four could heredity be regarded as a possible factor, and in these it was by no means clear. The mother of one patient had diabetes— an endocrine disease; in the three other cases there was a history of a condition similar to the patient's in one or more members of the family.

In regard to the immediate cause of the hypothyroidism, eleven patients connected the onset definitely with some previous illness, as follows: Five stated that they were well until after pneumonia or severe influenza, and that symptoms developed shortly thereafter. Three ascribed their condition to pregnancy, which in each case had been accompanied by toxemic symptoms. Two patients first noticed symptoms shortly after severe nervous and physical strain, and in one case the hypothyroidism followed surgical operation for goiter. Three patients stated that they had had the same symptoms as long as they could remember, but only one of them had the cretinoid appearance. In the remainder of the series there was no definite etiology for the condition, though several cases of past history of nervousness and cardiac palpitation suggested that over-activity of the gland had preceded the present hypofunction.

Only in those cases in which a definite cause was believed to exist could the duration of the condition be satisfactorily determined, but the average duration, when it could be ascertained, was slightly over eight years, excluding the three cases in which the condition is said to have always existed. This long duration suggests that hypothyroidism often escapes detection. It is not peculiar that it should, for the symptoms it causes are so indefinite and various, and, in this series at least, so different from the usual description in medical text-books, that they are often ascribed to other causes, particularly "neurasthenia."

The most common "presenting symptom" in this series of cases was a sub-efficient bodily condition. In fifteen cases, the complaint for

which the patient sought relief was described as "weakness," "chronic fatigue," "lack of ambition," or "nervous exhaustion." In eight cases the most prominent symptom was headache, usually cyclic and related to catamenia. Three patients complained of deafness, to account for which no aural pathology could be found except diminished response to stimulation. Falta[5] ascribes this deafness to swelling within the Eustachian tubes and tympanic cavity. In four cases "rheumatism" was the chief complaint, while insomnia, irritability, constipation, nausea and, less commonly, dyspnea were dominant symptoms. The menstrual history was normal in nineteen cases, the periods were described as irregular and scanty in two, but the disturbance was not important from the patient's point of view. Lack of perspiration and increased sensitiveness to cold were symptoms elicited only by direct questioning in a few cases. Loss of hair was complained of in every case, but this complaint is a common one in all female patients. Increase in weight was not a common complaint, though adiposity was present in half the cases. Constipation was a marked symptom in three cases; the bowels were described as slightly constipated or irregular in nineteen, and regular in three.

From this analysis of symptoms, it is clear that the history of the hypothyroid patient has only one characteristic feature,—sub-efficiency of the bodily machine. Whatever the symptom for which the patient seeks relief, there is always in the story a background of inefficiency—usually physical and, in the cases of long duration, mental as well.

On physical examination, the patients in this series may be divided into two groups: those with myxedema and adiposity, and those without. The weight in eighteen cases was compared with the normal as calculated from the tables of both Dreyer and West. Of these, twelve were overweight, the maximum figure being 44 per cent., and the average 16.5 per cent. Seven were underweight, the greatest deficiency being 27 per cent.; the average, 12.1 per cent. Of the seven patients whose weights were not calculated by the method of Dreyer or West, one was distinctly overweight, two were emaciated, and in the remaining four there was no striking departure from normal.

Other physical signs occurred as follows: The skin was described as normal in eight cases, as dry in ten cases, as dry and scaly or blotchy in five cases, and as myxedematous in two cases. Inasmuch as special attention was paid to the skin condition in this series of patients, it is believed that no abnormal condition was overlooked. Four cases had thyroid enlargement, none showed exophthalmos, one showed strabismus. The ears showed sluggish response to stimulation in three cases, diminished transmission of sound in one case. Two cases showed definite arthritis, one case had endocarditis. No other organic pathology was found. The pulse rate was below 80 in all but two cases, and below 70 in fourteen, and the temperature was subnormal in all but four.

Thus it appears that the most constant symptoms of hypothyroidism detectable by physical examination are, in order, subnormal temperature, bradycardia, changes in the nutrition of the skin, and obesity, but that the condition may exist without demonstrable nutritional change in the skin, or in the presence of underweight. It is perhaps significant that seven of the nine patients who were underweight showed no significant changes in skin, hair, or nails.

A fairly careful search of the literature fails to reveal any description of the thin hypothyroid patient. The general impression given is that expressed by Janney,[6] "thyrogenic obesity is one of the most early, striking, and persistent signs of the hypothyroid state." It seems worth while, therefore, to report a typical case in detail.

W. R. Female, single, age 42 years.

F. H. One sister has occasional bad headaches (No. 268, this series). Father died of angina pectoris, mother living and well. One sister psychopathic, one brother living and well.

P. I. "Has always had" headaches, coming on at irregular intervals, most frequently with catamenia. Headaches usually begin at night, starting in occipital region and spreading around head. Pain is severe, accompanied by nausea and there is considerable prostration for 24 hours after an attack.

Catamenia established at 12 years. Usually regular every 28 days, occasionally interval is 21 days. Duration five days, somewhat scanty the last three days. No pelvic pain.

Appetite usually good. No digestive difficulty. Bowels regular till recently, now becoming constipated. Sleep fair. No palpitation or dyspnoea on exertion. No urinary symptoms.

In spite of the headaches, patient is satisfactorily discharging the duties of a responsible executive position, though she finds it exhausting. Is inclined to be a little despondent about her headaches.

P. E. A well-developed, poorly nourished, painfully thin woman. Height 170 cm., weight 47.8 kg., being 15 per cent. by Dreyer's tables. Patient is very intelligent, no evidence of mental sluggishness. Skin sallow, cool. Hair not remarkable. Nails not remarkable. Tongue, slight white coat. Teeth well kept. Throat normal. Thyroid gland not enlarged. Heart, lungs, abdomen, and extremities show nothing abnormal.

Haemoglobin 85 per cent. Red cells 4,360,000, white cells 6,750, color index 99. The stained specimen shows slight achromia, poikilocytosis and anisocytosis, and a lymphocytosis of 55 per cent. The blood pressure was 126 mm. systolic, 84 mm. diastolic.

Chemical examination of the blood gave the following results: Blood sugar, 87 mgm.; non-protein nitrogen, 41.7 per cent. mgm.; urea, 16.9 mgm.; uric acid, 3.8 mgm.; creatinin 2.1 mgm.; Wassermann reaction, negative.

The urine examination was as follows: Amount (24 hours), 955 c.c.; sp. gr., 1013; no albumin or sugar; sediment not remarkable. Total nitrogen 8.6 gms. Urea, 86.1 per cent.; uric acid, 1.5 per cent.; ammonia, 3.2 per cent.; creatinin, 3.8 per cent.; undetermined nitrogen, 5.4 per cent. Phenolsulphonephthalein output in two hours, 51 per cent.

The basal metabolic rate was —30 per cent., temperature 97.5°, pulse rate 75, sugar tolerance (galactose)

test showed glycosuria with 40 grams, none with 30 grams; the alveolar CO_2 was 34 mm.

Thyroid medication was begun March 29, 1923. During the eight months since that date, patient has had one headache, due to great over-exertion. This is the longest period of freedom from headaches that she can remember. For several months previous to the inauguration of thyroid therapy, they had occurred every two weeks, and were very severe.

December 21, 1923, a second series of tests showed the following results. The patient has gained five pounds, in spite of the fact that she has been working harder than before. Temperature 98.6, pulse 72, basal metabolism +26. The analysis of the urine shows no abnormal constitutents. The nitrogen partition is as follows: Total nitrogen, 7:15 gms.; urea, 83.0 per cent.; uric acid, 2.1 per cent.; ammonia, 6.6 per cent.; creatinin, 6.2 per cent.; residual nitrogen, 2.1 per cent. The phenolsulphonephthalein test showed 55 per cent. in two hours. These figures represent a fall of 1.5 gms. in the total nitrogen, a fall of 3 per cent. in the urea, a rise of 0.6 per cent. in the uric acid, a rise of 3.4 per cent. in the ammonia, a rise of 2.4 per cent. in the creatinin, and a fall of 3.3 per cent. in the residual nitrogen. The total nitrogen output is very low, the urea is low, the uric acid low but increasing, the ammonia and creatinin are now above normal, while the residual nitrogen has diminished to a low figure.

The chemical examination of the blood shows a reduction of the non-protein nitrogen to 30 mgm., a normal figure, a reduction in the urea nitrogen to 15 mgm., also a normal figure, no significant change in the uric acid (3.6 mgm. against 3.8 mgm.), and an increase in the blood sugar to 91 mgm. The alveolar CO_2 remains low—32 mm.

If the findings in this case are compared with those representing the average for the series, it will be seen that they are typical of hypothyroidism. The urinary and blood findings are particularly interesting. They both suggest damage to the kidney.

Under treatment, the blood chemistry returned to normal, and the urinary findings showed a similar tendency to normal. Therefore there could be little, if any, organic pathology of the kidney present, and the retention was due to depressed function only. In untreated cases, however, the persistence of nitrogen retention in the blood, and of abnormal partition of the end-products of protein metabolism in the urine, may well explain the early arteriosclerosis often found in myxedema (Falta[5]), and may even be causal factors in the etiology of a chronic nephritis.

Newburgh and Clarkson[7] have recently published evidence suggesting that "renal injury as caused by diet is either solely attributable to the excessive excretion of some amino acids, or in part to the amino acids and in part to the acid character of the urine." Reference to Table 1 shows that over half the cases in our series excreted abnormally large amounts of undetermined nitrogen, and that the average alveolar CO tension was low. Polvogt, McCollum, and Simmonds[8] state that their recent work "furnishes experimental evidence that the excretion of excessive amounts of the normal end-products of protein metabolism may result in anatomical damage to the kidneys of an omnivorous animal when all other requirements for the nutrition of this species are provided for."

Such evidence is at least suggestive that the deranged proteid metabolism of unrecognized hypothyroidism and other endocrine hypofunctions may play some part in the etiology of chronic nephritis. Work is now being carried on at the Evans Memorial to determine the nature of the residue to renal trauma.

From a diagnostic point of view, certain findings deserve mention because of their availability in general practice. Prominent among these is the estimation of blood pressure, which showed hypotension in eighteen of the twenty-five cases. In fifteen cases the kidney function as determined by the phenolsulphonephthalein test was below normal, although the urine showed no definite signs of nephritis. Examination of the blood showed a hemoglobin content of less than 80 per cent. in only four cases out of 20 in which it was determined, and the erythrocytes numbered over 4,500,000 in fifteen of nineteen cases in which they were counted. The absence of anemia in patients complaining of fatigue or exhaustion is therefore suggestive of thyroid failure, and the presence of lymphocytosis is further evidence in the same direction.

It would seem, therefore, that while an absolute diagnosis of hypothyroidism cannot always be made without recourse to tests of vital function, that there are in the history, physical examination, and easily available laboratory tests enough suggestive signs to at least call to mind the possibility of such a condition. Fatigability, without causal organic disease; with a diminished kidney function but no nephritis; without anemia but with lymphocytosis; with a slow pulse rate and subnormal temperature, should make thyroid or other endocrine failure a condition to be proven or disproven in any case. In doubtful cases, recourse should be had to various tests of vital function and all other available methods of investigation before a diagnosis of neurasthenia is made.

SUMMARY

1. Twenty-five cases of hypothyroidism with clinical and laboratory findings are presented and discussed.

2. The most important findings in the histories, physical examinations, and easily available laboratory tests are emphasized.

3. The possible relation of the abnormal nitrogen metabolism to arteriosclerosis and chronic nephritis is pointed out.

4. The existence of a non-myxedemic type of hypothyroidism, possibly analogous to the Levi Lorraine type of pituitary insufficiency, is reported, with tabulated findings in nine such

TABLE

Case Number	Age	Sex	Basal Rate	Temperature (Oral)	Pulse Rate	Sugar Tolerance	URINE									
							24 Hour Amount	Specific Gravity	Alb.	Sugar	Sediment	Total N_2	Urea	Uric Acid	Ammonia	Creatinin
												Gms.	%	%	%	%
F- 10	51	F.	-42	96.4	64	60-50	680 cc	1011	0	0	N	5.1	71.6	1.6	1.8	4.8
B- 26	26	M.	-22	96.8	52	50-40	835 "	1028	0	0	N	9.2	79.6	1.4	6.6	5.1
B- 29	24	F.	-30	97.6	69	30-20	360 "	1028	0	0	N	6.8	85.5	2.5	5.3	3.4
B- 39	61	M.	-25	97.6	66	20-10	900 "	1024	SPT	?	N	10.7	87.1	1.7	3.8	4.2
B- 41	42	M.	-38	96.5	66	30-20	600 "	1030	0	0	N	10.0	90.5	1.1	4.0	4.2
M- 3	61	M.	-41	97.2	60	60-50	600 "	1023	0	0	N	8.8	86.1	1.6	2.4	4.4
495	37	F.	-20	98.2	81	60-40	720 "	1031	SPT	0	N	3.5	70.9	2.6	5.6	2.2
B- 68	44	F.	-30	98.4	74	30-20	700 "	1023	SPT	0	N	9.3	87.0	1.6	3.8	4.1
S- 26	40	F.	-10	98.8	90	N. D.	360 "	1031	0	0	N	4.3	72.4	1.8	5.3	3.7
S- 9	36	F.	-15	96.0	56	N. D.	900 "	1020	VST	0	1 cast	8.9	84.3	1.2	4.5	3.4
S- 67	25	F.	-12	98.8	70	N. D.	380 "	1032	0	+	N	6.6	70.3	1.8	4.0	2.7
S- 91	42	F.	-17	98.6	72	N. D.	1410 "	1016	0	0	N	7.6	75.9	3.0	6.1	4.9
S- 98	57	F.	-24	97.4	58	N. D.	1300 "	1023	0	0	N	11.8	76.0	2.9	4.7	3.2
S-108	35	F.	- 9	98.2	60	N. D.	720 "	1024	0	0	N	6.2	73.5	2.5	5.1	4.0
S-122	51	F.	-28	96.5	68	N. D.	1700 "	1017	0	0	N	11.0	90.4	2.0	2.4	3.5
B- 35	41	F.	-50	95.4	71	50-40	995 "	1013	0	0	N	7.6	80.6	1.6	4.6	6.6
B- 44	41	F.	-30	97.6	75	40-30	955 "	1013	0	0	N	8.6	86.1	1.5	3.2	3.8
B- 36	28	F.	-34	97.8	60	50-40	620 "	1029	0	0	N	10.7	83.8	0.9	2.8	4.2
S- 3	42	F.	-31	96.2	74	N. D.	1820 "	1016	0	0	N	....	....	....	....	....
S- 2	21	F.	-22	97.6	72	N. D.	1150 "	1017	ST	0	N	10.4	88.3	1.2	4.3	4.2
J-J	53	F.	-24	97.9	70	N. D.	....	1002	0	0	N	....	....	....	....	....
829	21	F.	-25	98.0	65	N. D.	800 "	1024	0	0	N	7.4	77.6	6.6	4.0	4.0
828	56	F.	-22	97.8	43	N. D.	1000 "	1018	0	0	N	8.1	77.8	3.0	6.9	4.3
B- 63	23	F.	-19	98.6	56	10- 0	1490 "	1012	0	+	N	10.4	88.7	1.6	5.1	3.8
268	48	F.	-22	96.8	72	N. D.	....	..	..	..	....	....	....	....	....	....

TABLE 2—Summar

	URINE													
	Age		B. M. R.	Temp.	Pulse	Sugar Tol.	24 Hr. Amount	Sp. Gr.	Total N_2	U %	U %	NN %	Creat.	Undeterm.
Max.	61		*— 9	98.8	90	60 gm	1820 cc	1032	11.89	90.5	6.6	6.9	7.0	21.2
Min.	21		—50	95.4	43	10 gm	360cc	1002	3.59	70.3	1.1	1.8	2.2	0.2
Average	37	10/12	—26.2 2 cases under —15 %	97.4 4 cases 98.6 or plus	66.3 Below 70 in 14 cases	40 gm Above nor. 6 cases Below nor. 3 cases Nor. 1 case Total 10 cases	915cc 1000cc or over 8 cases	1021 Alb. 5 Casts 1 Sugar 3	7.89	80.5	2.0	4.3	4.2	8.0

*While —9% must be regarded as a normal basal rate this case is included because of the presence of other signs and symptoms of hypothyroidism. In our experience, the basal rates in the first test are always maximum, and repetition of the test usually shows a fall of from ten to fifteen points as the patient becomes accustomed to the procedure.

TABLE I

Ammonia	Creatinin	Undetermined N_2	Phthalein Output	Blood Pressure	Blood Sugar	N. P. N.	Urea	Uric Acid	Creatinin	Wassermann Reaction	White Count	Lymphocytes	Eosinophiles	H. G. B.	Alveolar CO_2	Weight
				BLOOD												
%	%	%	%	mm	mgm	mgm	mgm	mgm	mgm			%	%	%	mm	
1.8	4.8	20.2	42	108/ 90	90	..	..	...	1.7	N	6,000	27.	10.	70	27	.....
6.6	5.1	7.3	74	104/ 58	105	..	..	....	....	N	....	35.	2	...	37	+ 2.1%
5.3	3.4	3.3	43	98/ 52	56	..	..	...	1.5	N	7,450	37.	2	85	31	.....
3.8	4.2	3.2	47	156/100	89	..	..	...	1.8	N	7,450	32.5	2	85	43	+36. %
4.0	4.2	0.2	60	114/ 86	81	..	..	...	2.1	N	7,850	25.	4	100	36	—11. %
2.4	4.4	5.5	45	122/100	109	..	..	....	....	N	9,800	39.	1	75	31	.....
5.6	2.2	18.7	65	124/ 84	?	...	...	....	....	N	17,700	45.	1	80	33	Emaciation
3.8	4.1	3.5	51	112/ 68	96	38.	20.	3.	1.8	N	6,800	31.	5	80	26	"
5.3	4.7	14.8	55	123/ 80	80	..	10.2	3.	...	N	6,500	31.	3	95	32	+ 2. %
4.5	3.4	6.6	40	110/ 90	105	30.	7.5	2.8	...	N	8,900	23.	1	85	22	+12. %
4.0	3.7	21.2	65	104/ 60	91	..	13.3	2.7	...	N	7,050	32.	2	75	54	— 2. %
6.1	4.9	10.1	58	108/ 55	100	21.4	8.3	2.1	...	N	9,950	29.	1	95	36	+ 5. %
4.7	3.2	13.2	40	90/ 50	100	40.	17.6	2.9	...	N	7,800	36.	2.	80	31	+44. %
5.1	7.0	11.9	63	100/ 60	100	40.	21.	2.7	...	N	6,150	43.5	0.5	90	34	— 8. %
2.4	3.5	1.7	..	104/ 70	90	30.	17.	3.	...	N	7,300	30.	2.	85	29	+30. %
4.6	6.6	6.6	33	100/ 68	71	31.	15.	3.7	1.5	N	5,250	25.	3.	70	33	+15. %
3.2	3.8	5.4	51	126/ 84	87	41.7	16.9	3.8	2.1	N	7,350	55.	1.5	90	34	— 9. %
2.8	4.2	8.3	43	120/ 92	73	45.	16.	6.9	1.7	N	6,750	43.	4.5	85	45	+ 7. %
....	....	....	43	110/ 70	80	23.	16.6	3.7	...	N	14,650	28.	1.6	95	38	+ 1. %
4.3	4.2	2.0	47	122/ 82	88	35.	18.	4.1	...	N	7,200	41.	1.5	90	...	— 8. %
....	....	....	..	98/ 64	...	..	..	...	...	N	....	..	..	...	....	.....
4.0	4.0	7.8	..	95/ 60	107	42.	17.	4.	...	N	10,400	24.	1.	80	36	—20. %
6.9	4.3	8.0	43	162/110	100	42.8	12.	4.2	...	N	....	..	..	...	36	+28. %
5.1	3.8	0.8	..	94/ 64	82	..	..	...	...	N	....	27.	4.	...	32	—27. %
....	....	....	..	140/ 70	...	..	..	...	...	..	....	..	..	...	...	obese

—Summary of Findings

Creat.	Undeterm.	Phthalein	Blood Pressure	Blood Sugar	NPN	$\frac{+}{U}$	$\frac{U}{-}$	Creat.	Lymphocytes	Alveolar CO_2	Weight
			BLOOD								
7.0	21.2	74. %	S—162 D—110	109 mgm	45.0 mgm	21.0 mgm	6.9 mgm	2.1 mgm	55%	54 mm	12 cases above normal
2.2	0.2	33. %	S— 90 D— 50	56 mgm	21.6 mgm	7.5 mgm	1.7 mgm	1.5 mgm	24%	22 mm	9 cases below normal
4.2	8.0	50.8%	S—112 D— 74.8 Above normal two cases Normal four cases Below normal 18 cases	91.1 mgm	34.6 mgm Above normal 9 cases Normal 4 cases Total 13 cases	14 5 mgm Above normal 9 cases Normal 5 cases Total 14 cases	3.5 mgm Above normal 6 cases Normal 8 cases	1.7 mgm 9 cases	34%	34 mm	.....

cases. Further investigation of this type is in progress.

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EFFECT OF ACETYLSALICYLIC ACID ON CARDIAC IRRITABILITY

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WITH the rapid progress of medical science during the past fifty years there has developed, naturally, two large groups of workers whose fields of activity are rather sharply delimited. The evolution of the two groups has been inevitable because of the peculiar nature of scientific medicine, it being the application generally of both the scientific discoveries and so-called "art" of medicine to the prevention and cure of disease. In the present state of the development of medicine the division into two groups is likely to continue for some time. One group is primarily concerned with the fundamental sciences upon which medicine is based; the other group is concerned with the correlation and practical application of the discoveries evolving from the laboratories; also, they are concerned with the further correlations of their own discoveries arising in the course of their daily routine, and with phenomena of disease for which there is no satisfactory explanation either from themselves or from those concerned in the fundamental sciences. Conflict of opinion between these two groups of men is as inevitable as is the difference in views of one whose horizon is limited and one whose horizon is unlimited. This division into groups, with their divergency of opinions, is, however, a valuable stabilizer, not only to medicine as a whole but to the groups themselves. For it is well within the memory of all how a fabulous course of treatment has sprung from a row of test tubes, beakers and chemicals, and how this treatment has with no great delay been refuted or accepted by those who are the final judges in determining adequacy or inadequacy of any treatment; and, too, it is as easily recalled how some of the so-called cures used by the latter have been shown in the laboratory to be most distinguished examples of that age-long and well-known phenomenon of bodily restitution not because of, but notwithstanding the treatment. Thus one group stands ever ready and alert to "check up" the other group, and so there has developed a desirable *esprit de corps* in the profession which has resulted in a sound, steady and rapid growth of the science of medicine.

The phenomena of stimulation or depression of life processes, either normal or diseased, have not infrequently been sources of disagreement between laboratory men and clinicians. Usually the disagreement is only apparent and not real. Thus, the clinician may claim that a certain drug stimulates the kidney, thereby producing an increased flow of urine; the laboratory worker upon investigation of the same drug secures evidence pointing to a blood-vascular effect that increases activity not only of the kidney but of various other organs, but no evidence of stimulation of the kidney *per se* by the drug. Divergent opinions respecting drugs acting upon the heart have frequently arisen. For many years strychnine was regarded clinically as a heart stimulant, whereas, with the growth of laboratory science, evidence has accumulated to show that the drug is not a heart stimulant when used experimentally in amounts comparable to those used for therapeutic purposes.

We have been interested in this laboratory in the effects of various drugs upon the irritability of the heart, since divergent opinions are so frequently expressed respecting stimulation or depression of that organ by drugs. We have undertaken a study of a series of drugs which act on the heart, but will report here only one which is more nearly complete than the others. Acetylsalicylic acid (aspirin) has frequently been a source of question to us concerning its depressant action on the heart. Some clinicians regard it as a heart depressant, others as a heart stimulant, and still others as having no effect at all. In the course of these investigations it was thought advisable to resort to the simplest methods used physiologically to determine whether a function has been stimulated or depressed. Thus the threshold of a certain function may be determined quantitatively, and if the application or administration of an agent lowers that threshold we assume that the agent has stimulated it, whereas if the agent has raised the threshold we conclude that its function is depressed, inasmuch as its constant activity must depend upon its response to constant or intermittent stimuli.

In the study of acetylsalicylic acid on cardiac irritability we determined the threshold electrically of the frog's ventricle, using the Martin method of quantitative faradic stimulation.[1] In some instances we performed experiments upon the perfused isolated frog heart, and also made blood-pressure records of anesthetized cats re-

ceiving the drug intravenously. The method used with frogs was briefly as follows: the animals were weighed and given a dose of a freshly prepared solution of acetylsalicylic acid into the ventral lymph sac. At the end of one hour, the animal was double pithed, the heart exposed and ligated so as to produce standstill by a method described in a previous paper by one of us.[2] Platinum electrodes were then introduced into the ventricular muscle about 2 millimeters from the auriculo-ventricular ring, and the points were adjusted 2 millimeters apart. The tip of the ventricle was attached by means of a light clamp and thread to a light lever recording with a writing point on a revolving smoked drum. The threshold of contraction was then determined after twenty minutes, since it has been shown that the irritability does not become steady after the operation until the lapse of at least fifteen minutes. In some experiments the cardio-skeletal quotient was determined in order to verify our threshold results, for it has been shown that the cardio-skeletal quotient is a constant factor, and that if the gastrocnemius muscle be kept constant, an increase in the quotient indicates an increased irritability of the heart. In these experiments one leg of the frog was ligated before the drug was injected, thus keeping it free from the drug. One hour after injection of the drug the frog was double pithed, the heart threshold and the ligated gastrocnemius threshold were taken. Normally, using this method, it requires six times as strong a shock to make the heart contract as it does to make the gastrocnemius contract, and that relation is expressed by the cardio-skeletal quotient which in a large series of frogs was found to be 0.17. In the experiments with isolated frog hearts the method of Straub-Fuehner was used and records obtained on a smoked drum. The heart was perfused with varying strength solutions of acetylsalicylic acid, and atropine was used in some instances previous to acetylsalicylic acid in order to rule out vagus effects. In the experiments with cats the drug was given intravenously to the animal while it was anesthetized with urethane and connected to a manometer recording blood pressure.

In the first series of frogs twenty-one experiments were performed with acetylsalicylic acid with a dose of one-fourth milligram per gram of frog weight. This size dose was chosen because it represented a convenient amount of fluid for injection purposes, since the drug is so sparingly soluble in water. This size dose is considerably larger than is ordinarily given therapeutically per gram of patient. Eight other frogs from this same group were used as control frogs, *i.e.*, were submitted to the same experimental procedure except the drug was omitted. The results of this series were averaged and are shown in Table 1. The value of the threshold is indicated by Z units of Martin. An increase in the stimulation unit indicates a decrease in irritability or depression of the tissue which is under observation, and, conversely, a decrease in the stimulation unit indicates an increase of irritability or a stimulation of the tissue. Reference to the table reveals the fact that the ventricle, when exposed to the influence of acetylsalicylic acid, is stimulated definitely though not to an extreme degree.

TABLE 1

	Control Frogs	Acetylsalicylic Acid (Aspirin) Frogs	Variation from Normal	Percentage Change
Average Z Unit	182.4	119.8	62.6	34.3

In the above series of experiments there were comparisons made between the responses of similar tissues in two groups of frogs, one the normal group, and the other the treated group. While this method yields valid results, yet it was thought that if part of the frog could be kept normal or free from the drug, comparisons of its known body constants would reveal a more accurate picture of the drug effects and at the same time verify or disprove the figures obtained in the first series. The cardio-skeletal quotient is a body constant and affords a means of making the desired comparison, and therefore a series of experiments were run in which the cardio-skeletal quotients were determined. Nine experiments were thus performed and five control experiments. In a previous paper it was shown that the cardio-skeletal quotient is represented by the figure 0.17 and the controls were made in order to verify that figure. The results showed a figure for the cardio-skeletal quotient of the same degree of magnitude as was reported in the previous paper. In this series it was found to be 0.19. The averages of these experiments are shown in Table 2. As shown in a previous paper, if the gastrocnemius is kept normal and the cardio-skeletal quotient shows an increase, it indicates an increased irritability of the tissue or stimulation. Reference to the table reveals the fact that the change in the cardio-skeletal quotient under the influence of acetylsalicylic acid indicates stimulation of the ventricle more strikingly than do the figures in the first table, thus, the quotient is increased over fifty per cent.

TABLE 2

	Control Frogs	Acetylsalicylic Acid (Aspirin) Frogs	Variation from Normal	Percentage Change
Cardio-skeletal Quotient	0.19	0.30	0.11	57.8

In order to obtain further evidence of the effect of the drug upon the performance of the heart, some isolated frog heart experiments were made. Extremely large doses, greater than could be conceivably used therapeutically, caused a cessation of the heart beat, but when the concentration more nearly approximated that in the heart under therapeutic conditions, then the heart showed an increase of rate and amplitude indicative of stimulation. This occurred even after atropine had excluded the possibility of vagus effects.

Some experiments were performed on cats to test further any stimulative action upon the heart and to see if any evidence might be obtained which would strengthen or support the evidence yielded by the measurements of the thresholds of the frog ventricles. Blood pressure records were made. Doses comparable to, and larger than, those used in the human were administered intravenously in salt solution. The results uniformly showed an increased heart rate and increased blood pressure, both with the nerve supply intact or interrupted either by vagotomy or atropine. In one animal the total dosage was 0.250 gm. (0.131 gm. per kg.). At the end of five hours the heart and circulation of this animal were in excellent condition and the animal was killed with ether.

The above evidence would indicate that acetylsalicylic acid is not depressant to heart or circulation in ordinary or in very large doses; rather it indicates a possible beneficial effect upon the heart muscle. This no doubt explains why so few fatalities have occurred from this drug, which is used promiscuously both by physician and laity. The above evidence would indicate relative harmlessness to the heart in the therapeutic doses ordinarily used. Reference to occasional strong or unusual heart beats by patients taking aspirin may be due to premature systole which might occur with increased irritability of the heart muscle, especially in one who has taken a very large dose or in one who is unusually susceptible to the drug.

The evidence obtained in the above investigation seems to warrant the following conclusions:

1. Acetylsalicylic acid has a stimulant effect upon the heart muscle as indicated by a lowering of its threshold upon electrical stimulation.

2. The stimulating effect of acetylsalicylic acid is directly upon the heart muscle, and is not due to paralysis or inhibition of the vagus mechanism.

3. The drug is depressant to the heart muscle only in concentrations much higher than is likely to occur even in enormous doses of the drug.

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HISTOPATHOLOGICAL ALTERATIONS IN THE CELLULAR NEUROGLIA AND FIBRILLARY MESOBLASTIC COMPONENTS OF THE CEREBRAL CORTICAL INTERSTITIUM

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HISTOPATHOLOGICAL alterations in the cerebral cortical interstitium are described in this paper. These are readily demonstrable changes of a progressive as well as regressive nature among the cellular components of the glia, and fibrous proliferations of mesoblastic elements—fibers emanating from the adventitia of the vascular apparatus and invading the neural terrain. The glial alterations are well shown with Cajal's gold chloride and sublimate method for the selective staining of the cellular glia, the mesoblastic with Achucarro's tannin argentic procedure for the differential display of connective-tissue fibers. Here also, for purposes of background on which to sketch the development of present conceptions as to function of some of these structures, is included a discussion of the views of other observers who have studied the cerebral interstitium.

Early attempts to correlate disordered mental and nervous function with demonstrable changes in the finer anatomy of the brain and spinal cord were concerned almost wholly with alterations in neural elements—nerve cell, nerve fiber or myelin sheath—due no doubt to the then prevalent exaggerated *Master* conception of the nerve cell. Recent studies, however, of the glial and mesoblastic structures of the cerebrospinal axis have given to these formerly regarded minor elements a dignity which in histological interest and suggested functional importance, rivals that of the nerve cell itself. But from this it must not be understood that in consideration of the pathological anatomy of mental and nervous disease neural elements necessarily lose significance or even paramountcy. Sound conclusions drawn from the finer morphological alterations in the brain and spinal cord are governed not so much by specific changes in either the parenchyma or interstitium as by the sum total of changes, by the relationship of these to each other, their probable bearing on disordered function in the nervous apparatus itself and their possible relationship to distant processes. It is apparent then how far short of all this we fall unless clear and reasonable conceptions serve us as to structure and function of elements the changes in which we attempt to interpret.

Alzheimer,[1] from his studies on the neurolgia (1910), was able to show that pathological glial reactions were not always dependent on neural changes. Alterations of a morbid nature among the cellular and fibrillary components of the

glia, be found, could frequently be demonstrated in advance of pathological neural changes. These observations of Alzheimer, conflicting as they did with one of the main points of Weigert's conception of the function of the glia, have since received abundant confirmation. It will be remembered, Weigert had contended that every destruction of nervous tissue within the cerebro-spinal axis was replaced by a proliferation of glia cells and the production of glia fibers, implying that such glial changes could only take place after injury to nervous elements. Were this true in every instance, or in the majority of instances, then a glia preparation might well serve as a graph of the amount of neural destruction of any given area in a brain with destructive lesions. As a readily determinable fact, considerable destructive change may occur among the finer neural elements without demonstrable proliferative reactions of the glia, to say nothing of the coarser cysts of softening which are almost never replaced by glial proliferations. It is conceded, however, that an active proliferation of glia cells and fibers may be regarded as resulting from neural destruction (gliomatous areas excepted), but absence of such proliferations cannot be construed as evidence of neural integrity.

In seeking an explanation for the early glial changes to which Alzheimer calls attention, one is well-nigh forced to the conclusion that either our technical methods are not sufficiently delicate to detect the earliest neural changes, or that under certain conditions the glia bears the first shock of noxious agencies. Further, judging from those technical methods which have in view the differentiation of biochemical products of pathological metabolism, as well as from the evolution of structure, one comes to feel that perhaps the glia also performs important metabolic functions. Indeed, so strong is this feeling among certain observers that they regard the glia as a sort of glandular organ, elaborating and secreting chemical stuffs upon which depend the physiological integrity of the neural elements.

FIG. 1.

When we turn to a consideration of the mesoblastic elements of the cerebral interstitium again we find necessity for a revision of some commonly accepted views. The domains of the mesoblastic and epiblastic (glial) elements of the cerebro-spinal axis can no longer be regarded as permanently delimited and inviolate, for the methods of Snessarew,[2] Achucarro[3] and Alzheimer[1] have clearly demonstrated that their frontiers may be crossed and recrossed by the cellular and fibrillary components of each.

Weigert[4] in his epoch-making monograph on the neuroglia (1895) described with great detail the fibrillary constituents of this tissue and there set forth certain views concerning the func-

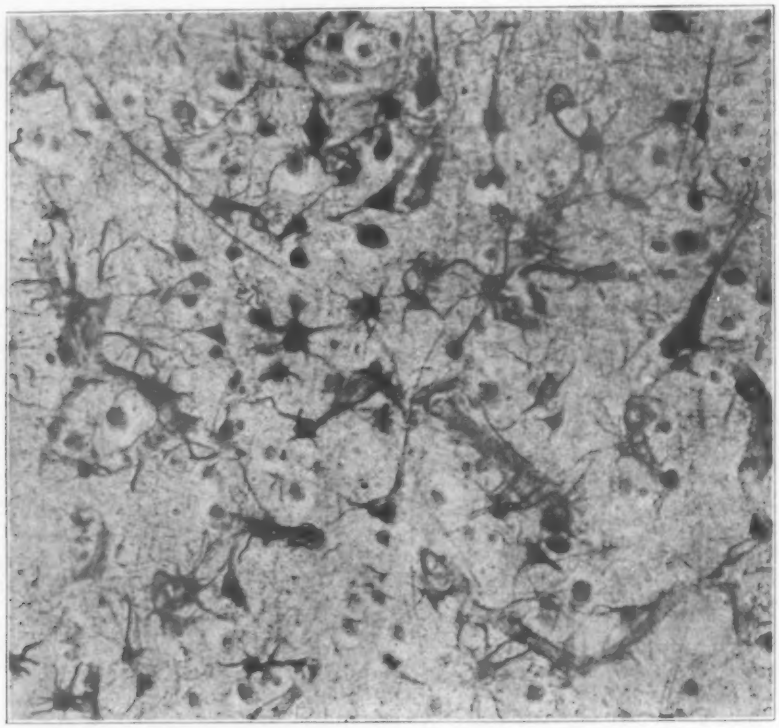

FIG. 2.

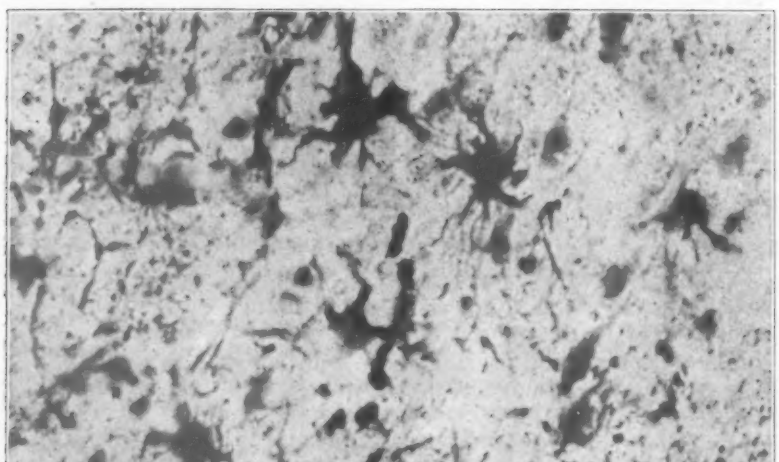

FIG. 3.

tions of the tissue as a whole. Perhaps the most striking of Weigert's conclusions were those referable, first, to freed glia fibers,—fibers of which he conceived as not only morphologically separate but chemically distinct from the glia cell protoplasm; second, the rôle of a defensive cor-

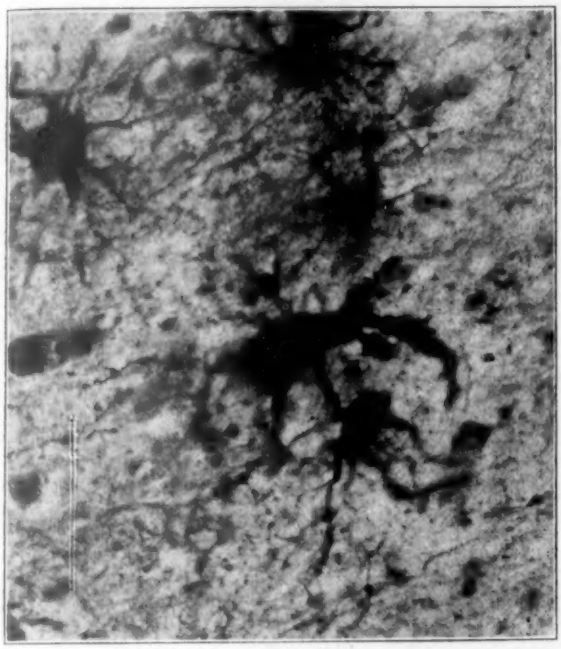

FIG. 4.

don accredited to glia fibers normally found in abundance in certain localities; and third, replacement activities conditioned upon neural destruction. In other words, glia fibers though formed by a certain type of glia cell are later emancipated from their cells of origin and continue a separate and independent existence. Moreover, by an early (developmental) mobilization at certain strategic points, namely, at the cortical and spinal periphery, beneath the empendyma of ventricles and around the blood vessels which penetrate the brain and spinal cord, fibers thus amassed serve as barriers against invasion of the neural terrain by mesoblastic connective-tissue elements. These were revolutionary views, compared with the then accepted teachings as to the glia cell and its processes. Though Ranvier[5] had earlier (1883) contended that glia fibers were not processes of glia cells, but special structures which passed through the cells, Weigert went a step further, maintaining that they did not even pass through but coursed over the surface of the cells and, moreover, were chemically distinct in composition from that of the cell protoplasm. These views, as the literature attests, had defenders as well as opponents.

Perhaps the most strenuous opponent of Weigert's theories, as to the structure and at least to one function ascribed to the glia, was Held.[6] This observer was convinced from his studies (1903) that Weigert's supposedly freed fibers were only apparently emancipated, due as he believed to the technical limitations of the Weigert method. Held pictured glia fibers stained in a contrasting manner surrounded by protoplasmic substance which were not confined as Weigert had maintained, solely to the periphery of the cells, but also found deep in the protoplasm. Considerable evidence has since accumulated in support of Held's objections to emancipated glia fibers, in view of which the writer believes that neurohistologists should speak with great reserve concerning emancipated glia fibers. Held also gave a different interpretation to Weigert's so-called *glia Kiel*,—the grouped fibers which were supposed to act as a defensive cordon,—for he regarded this group arrangement as a sort of sieve for the passage of nutrient stuffs from the mesoblastic apparatus (vascular) to neural elements, rather than as a protective barrier against invasion. From his embryological studies Held concluded that the glia not only developed from a syncitial protoplasmic structure but remained essentially such in the fully-developed organ. This syncitium, it was stated, has an early embryonic origin which later in its course of development exhibits at the nodal points certain nuclear elements. These nuclear elements are the progenitors of the astrocytes, the type of glia cell which gives origin to glia fibers. The conception of a glial syncitium is also shared by Hardesty, Ranke, Alzheimer and others.

Cajal,[7] with his gold chloride and sublimate method, from studies on the nervous system of man, dog, cat, and rabbit, is convinced that the syncitial structure described by Held and others does not exist. The method stains the cellular glia in a most selective manner, displaying in a wonderful way the processes of the cells to their finest branches which nowhere show anastomoses with branches from other cells. The studies of Cajal were undertaken with the following aims in view, to determine: (1) morphological types of the glia, (2) structure of the glia cell protoplasm (spongioplasm, centrosomes, gliosomes, fibers), (3) the interstitial diffuse felt-work of the gray substance, (4) autolytic changes of the glia and the abnormal structures to which they give rise, (5) the so-called third element of the cerebro-spinal axis or adendritic cells, (6) to arrive at some conclusions with reference to the glia of the lower animals, and (7) gliogenesis.

The outer form of the glia cells as displayed by the gold chloride and sublimate method confirms in the main the types described by Golgi, cells with long processes and cells with short processes, to which is added a mixed type. The glia cells display a wealth of processes and, depending on the plane of the section, one of these processes may be followed to a neighboring blood vessel where its distal extremity expanding takes on a trumpet shape and is implanted. So frequently is this relationship shown that Cajal be-

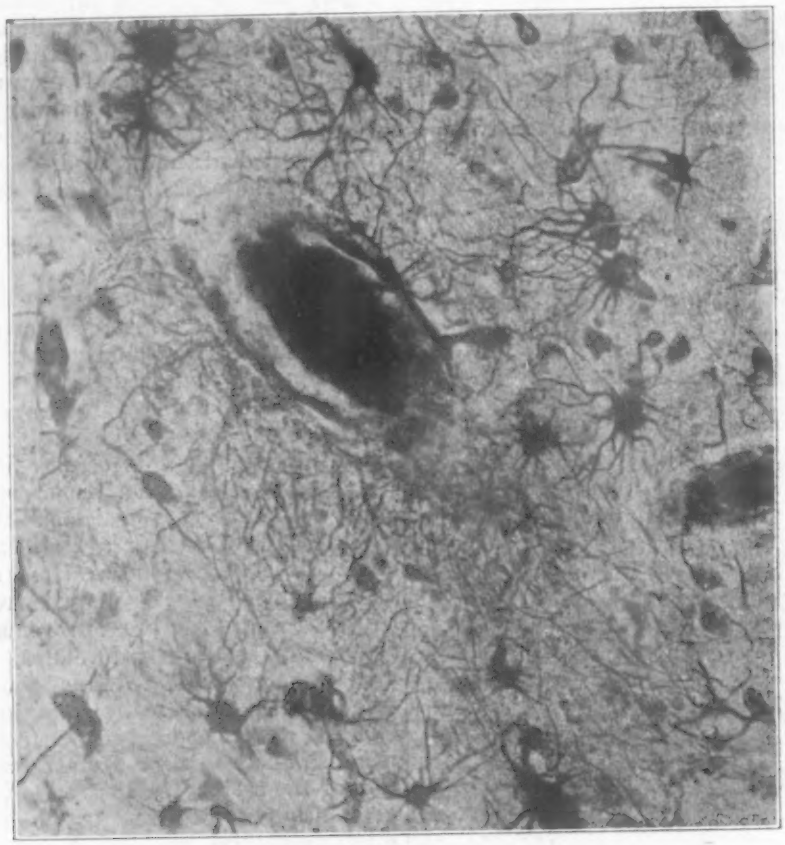

FIG. 5.

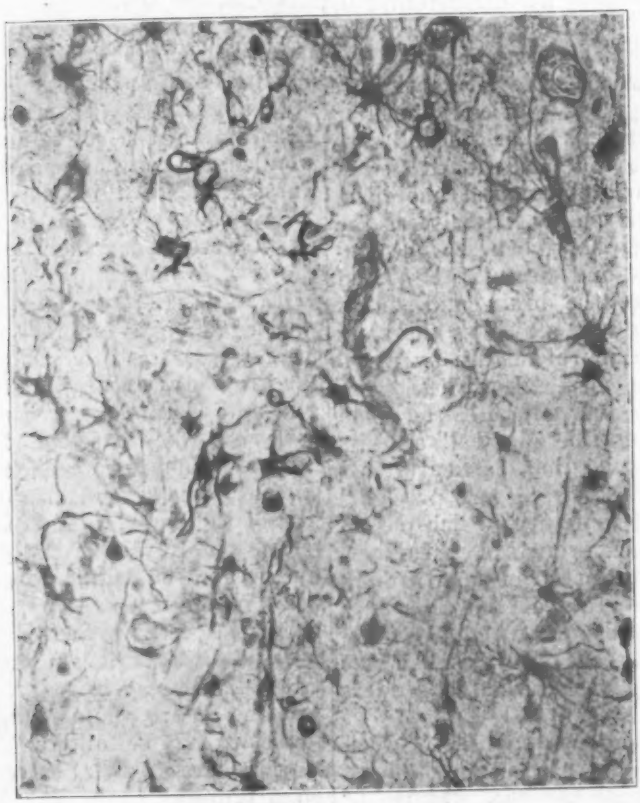

FIG. 6.

lieves no astrocyte is without a vascular process. Certain sucking functions are ascribed to the vascular process which is designated as the *apparatos cupadores* and regarded as the most important part of the glia cell. Normally this particular type of process at first usually shows no great variation from the other processes given off, save its less undulating course, until near the distal extremity, where the change noted above takes place. In the embryogenetic account of the vascular process it is stated that as soon as the epithelial cell leaves its empendymal position its differentiation may be noted, usually through a metamorphosis of the outermost extremity of the primitive empendymal cell but sometimes by a lateral budding from a radiating process. It now takes on amoeboid movements in the direction of a blood vessel where on reaching its goal it ends in a terminal swelling. All of this is coincident with the buddings which give rise to processes in the early developmental stage of nerve cells. The cell protoplasm is spongy in appearance, displaying small clear spaces which are negatives of certain granules shown by other methods, the gliosomes or mitochondrones of Fieandt,[8] Nageotte,[9] Mawas[10] and Achucarro.[11] The centrioles or centrosomes are also well stained and located usually where cell protoplasm is most abundant, though oftentimes near the area where the vascular process takes its origin. As regards the diffuse felt-work of the gray matter and its syncitial character, the results of the gold chloride and sublimate method seem particularly informing, for in successful preparations the gray matter is evenly penetrated by the processes of the glia cells, exhibiting nowhere a true net-work as conceived by Held, Hardesty[12] and others. Other features which controvert a syncitial structure are certain pathological alterations and post mortem changes, shown by disintegration of the cell protoplasm and fragmentation of its processes. Pathologically, the fragmentation is confined to relatively small areas in the midst of which, or near by, glia cells with all of their processes well preserved, may be seen. The glia trabant cells (satelites of nerve cells) are well shown by the method and differentiated from other cells (adendritic cells) surrounding the nerve cells. Here, too, these trabant cells with their wealth of branches as they envelope the nerve cells, disprove a syncitial structure, and also the existence of a pericellular glia net surrounding nerve cells, as argued by Golgi. The adendritic cell protoplasm is not stained by this method and partly for this reason is not included among Cajal's types of glia cells. These are the cells displayed by most methods as small round cells, not unlike lymphocytes in appearance found in the neighborhood of nerve cells, near blood vessels

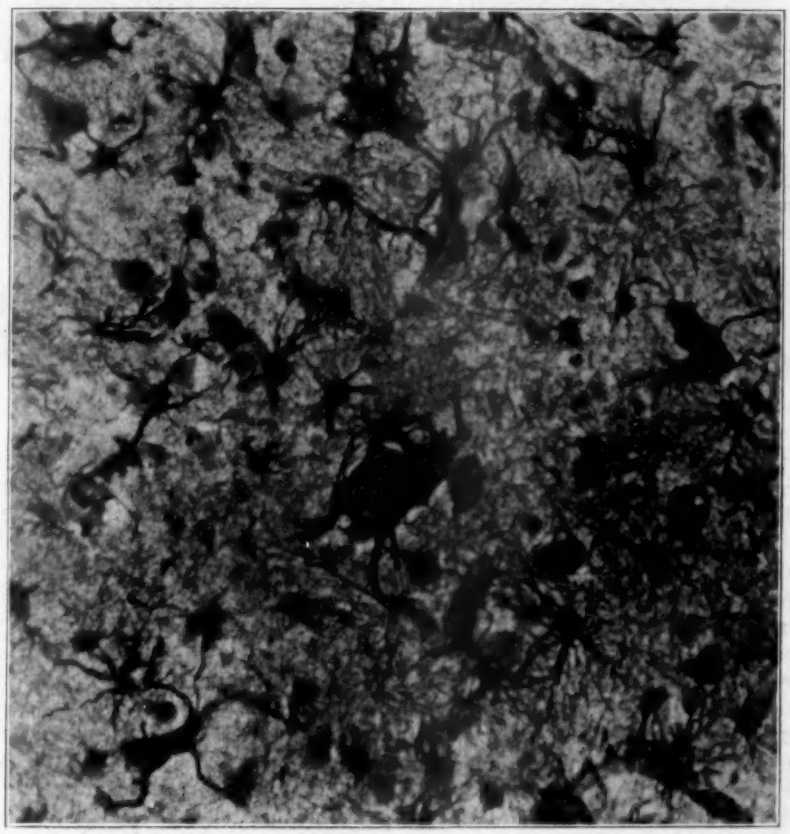

FIG. 7.

and generally disseminated throughout the white substance. These cells are shown by the gold chloride method surrounded by clear white spaces and Cajal designates them as the "third element" of the cerebrospinal axis. He believes them analogous to the cells of the sheath of Schwann in peripheral nerves and that they are of mesoblastic origin. The glia cells in the human cortex differ from those in the cortex of cat and dog in a greater endowment of protoplasmic cells which form a thicker felt-work, and

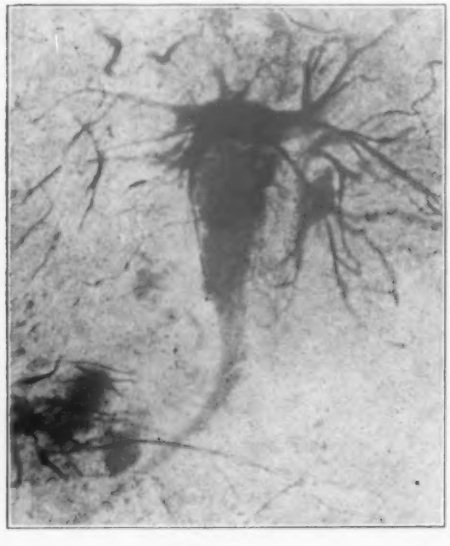

Fig. 8.

Cajal thinks it probable that these protoplasmic cells have a secretory function. He regards protoplasmic and fiber forming glia cells as having a common origin, that is to say, arising from empendymal cells and becoming differentiated at a later stage of development. Glia fibers, Cajal believes, may be regarded as evidence of involution in the glia cells which have lost their secretory characteristic, and this involution may take place in embryonic life as well as later.

With the normal structure of the autonomous glia cell outlined above—spongy protoplasm exhibiting small clear spaces (gliosomes), numerous protoplasmic branches, one of which at its distal extremity expanding in a trumpet shape, implants itself in the wall of a neighboring blood vessel—we may pass on to a consideration of the changes which take place in this type of cell under certain pathological conditions of the brain. For this phase of the glia, as here reported, the brains from subjects dying of general paresis, non-paretic cerebrospinal syphilis, senile dementia, cerebral arteriosclerosis, multiple sclerosis, tuberculous meningitis and epidemic encephalitis, have been employed. These, to be sure, are types of brains which show frankly organic changes with almost all of the commonly used technical methods. The so-called functional disorder types of brains, from the writer's experience show few, if any, fundamental structural changes in glia cells with the gold chloride and sublimate method. Here the glia cells more nearly approximate the normal appearance as described by Cajal, Achucarro, and others. The changes in the first group of cases which are here regarded as pathological are: loss of the spongy appearance of the cell protoplasm, less tortuosity in the course of the

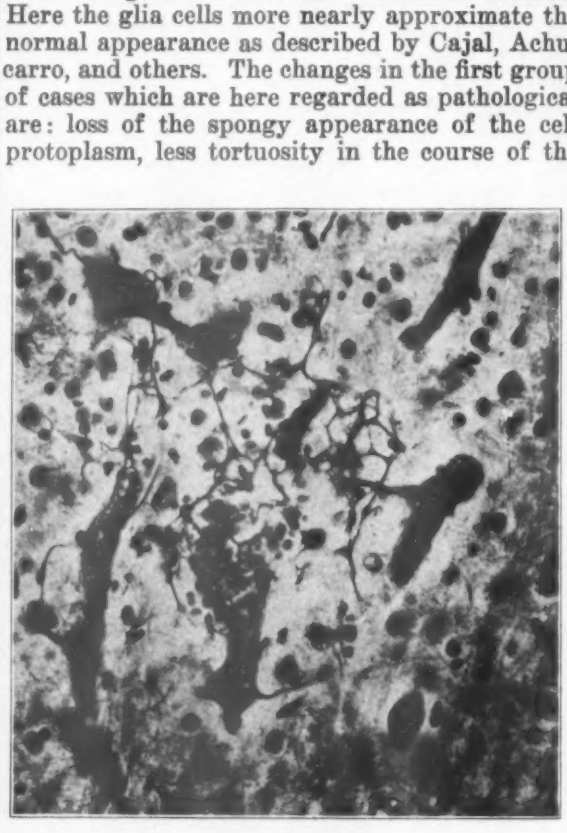

Fig. 9.

cell branches, hypertrophies and atrophies, pronounced increase in the vicinity of acute foci, diffuse proliferations in chronic processes, fragmentation of the cell body and its branches and redundant and bizarre types (trabant cells) suggestive of neuronophagic activities found plastered on degenerated nerve cells.

In Fig. 1 is shown a proliferation of glia cells. Some of these cells are hypertrophied, others atrophied, and while they possess fairly numerous branches they are less abundant than in normal cells of this type. Almost universally one of these processes may be followed to the wall of a blood vessel and where such do not show, is due, the writer believes, to the plane of the section or to the plane of focus in the photomicrograph. In Fig. 2, section from a markedly atrophic paretic cortex, prefrontal area, processes of glia cells are relatively scant. The cell protoplasm stains less deeply and has much the appearance of glia cells as shown in Weigert preparations. Here in this area, by fiber staining methods, a glial fibrillosis was marked. Nevertheless, processes with vascular attachments are unmistakable. Cajal's so-called third elements are well shown throughout the picture—palely staining round nuclear structures surrounded by clear spaces. In Fig. 3 hypertrophied glia cells undergoing autolytic changes are shown. The processes are swollen,

present knob-like excrescences and the cell protoplasm deeply tinged. Scattered throughout the section are particles of the fragmented processes and cell bodies which are of varied size and shape. Fragmentation of glia cells and their processes was described by Alzheimer, particularly of his amoeboid type, and to these fragments he gave the name Fühlkörperchen. As here shown the condition is described by Cajal under the name of Klasmatendrosis. Cajal has seen the process in frankly pathological conditions, also as resulting from post mortem autolysis, though in the latter involving extensive areas. Here in the case from which this picture was made the process was confined to small areas, 2 to 5 mm. in extent, and adjoining them areas as seen in Fig. 1. In fact, both these photomicrographs (Fig. 1 and 3) were made from the same section, under like magnification, exposure, etc. Moreover, this case was autopsied within four hours of death, a paretic, whose disease had run a short and stormy course, terminating finally in a haemorrhagic pachymeningitis. In Fig. 4 is shown the border of such an area as described for Fig. 3. Here two near lying glia cells are shown in fair state of preservation while the large cell in the centre presents enormous swellings and excresences of its processes. In Fig. 5 is presented a picture of the neighborhood of a blood vessel in the polymorphous lamina, prefrontal area. There is hypertrophy of some cells with fair preservation of processes. Great wealth of processes on all sides of the vessel suggest a net or syncitial structure, but close study of this section does not convince the writer that a true net-work exists. Here in this area, as shown by fiber staining methods, fibers were numerous, but here not a single glia cell, showing evidence of the presence of gliosomes in its protoplasm, was encountered. Not only does a picture of this area but the findings in general confirm the position taken by Achucarro, Fieandt and others that where gliosomes are scant fibers are numerous and vice versa. In Fig. 6, photographed from a case of senile dementia, the condition presented is not unlike that in Fig. 2 from a markedly atrophic paretic cortex. In Fig. 7 is shown a glial proliferation not greatly distant from a tuberculous meningo-encephalitic area. Here the proliferation may be regarded as exuberant. In Fig. 8 is shown a trabant glia cell, closely applied to the base of a nerve cell, and among its processes a non-glial satelite cell. In Figs. 9 and 10 are shown mesoblastic fibrillary proliferations emanating from the adventitia of vessel walls and invading the neural terrain, and also anastomosing with fibers from other vessels.

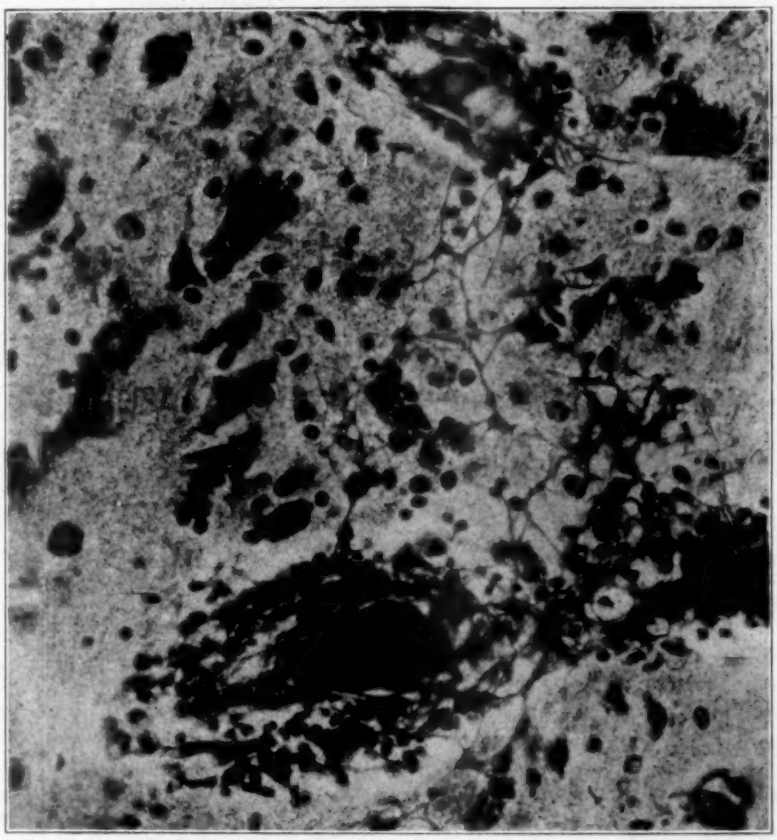

Fig. 10.

both from paretic cortices. In Fig. 9 the vessels from which they take origin are small, and Fig. 10 larger vessels. While vascular proliferations in the cortex are often more apparent than real, as the writer has pointed out in an earlier paper[13] they do occur and take origin from the endothelium. These two pictures show, as also Fig. 11, that not only may endothelium

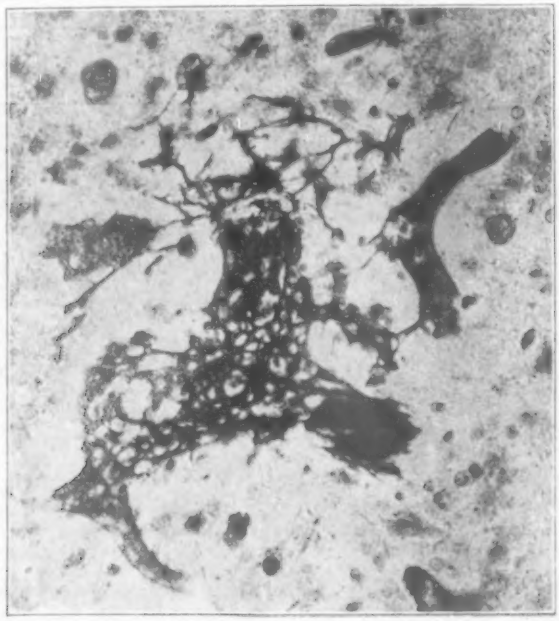

FIG. 11.

invade the neural territory but adventitial elements as well. They show also that Weigert's defensive cordon of glia fibers around blood vessels, at least, is not always effective.

The vulnerability of the glia is well known to all who have studied this tissue and it is quite conceivable that primary degenerative changes of the glia may precede or even set in motion morbid changes among neural elements. If one is inclined to admit endocrinous functions to the glia then one would have no hesitancy in believing many neural disorders could result from the secretions imparted to nervous tissue by glia cells. The Spanish school of neurohistologists, who are the chief exponents of the secretory function of the glia, base their conceptions, not so much on the vascular process of the glia cells as seen in man and the higher vertebrates, but on their phylogenetic studies of the glia as observed (Achucarro) in Amphioxous, teleeostean fishes, amphibians and birds. Here in the lower vertebrates the glia is represented by empendymal elements which send out fibers to the periphery and to blood vessels. They conceive for this structure (the empendyma) secretory functions. In the course of evolution certain empendymal cells emigrate from their original position and become independent and attach themselves by means of one of their processes to a vessel wall and continue their secretory function, just as other cells which were originally empendymal in origin (*e.g.*, choroid plexus cells) continue a secretory function. By their autonomous position and in their proliferative activities they make possible a greater neural development, by being able to furnish more numerable channels for nutriment to neural elements. If one accepts this fascinating theory one catches a faint glimmering of the reason why adrenalin and other products of the glands of internal secretion affect so quickly and materially nervous processes; to use a single example, the effect of adrenalin on the emotions.

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Case Records
of the
Massachusetts General Hospital

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY
RICHARD C. CABOT, M.D., AND HUGH CABOT, M.D.

F. M. PAINTER, ASSISTANT EDITOR

CASE 10081

An American physician of sixty-two entered December 12 complaining of weakness of three months' duration.

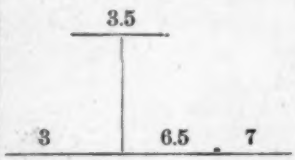
F. H. One uncle and one brother died of tuberculosis, his father of cancer.

P. H. He had the diseases of childhood and scarlet fever, typhoid fever, bronchopneumonia and influenza. At thirty-nine he had rheumatic fever. At forty his ear drum perforated, with some residual deafness. His teeth were all gone. His bowels, always constipated, had been especially so for the past year. His best weight was 206 pounds, his usual weight 194, his present weight 174.

Habits. Good.

P. I. Twenty-five years before admission he was in bed for some weeks with an attack of influenza. From that time he had almost hourly urination which had persisted, and a very gradual development of nervousness and lassitude. He commenced also to have pain between the shoulder blades when he was tired. He felt increasingly run down, although he continued a busy country practice. He became very liable to winter colds. For fifteen or twenty years he had had "dyspepsia"—an epigastric burning sensation following meals quite usually. He did not examine his urine until six years ago, when he was told that it contained albumin and casts. The symptoms progressed gradually until the September before admission. At that time he had discontinued practice and was working in his brother's laundry. Early in September he began to feel so much weaker that he was unable to continue his work. His vision became worse, and for the first time he began to vomit, at first once a week, more recently once or twice a day. The vomiting occurred sometimes just after meals, sometimes on awaking at night. The pain between the scapulae and at the base of his neck became much worse—a dull aching pain, continuous day and night, and for at least two weeks very severe, somewhat relieved by pressure. Recently it had been less severe and had moved downward to the right flank and laterally to the costovertebral angle. Since September he had had a feeling of numbness, heat and cold, and latterly of moderately severe cramps in his extremities and chest. The "dyspepsia" had become worse, and had to be relieved by food. In the past weeks there had been some tremor of the hands. The most persistent and troublesome symptom was weakness, which had increased until he was practically confined to the house and in October was in bed for two weeks. Since September he had been on a diet of milk. During the past three months his memory had failed and he had been very absent minded.

P. E. A well nourished man showing evidence of loss of weight. Skin showed sallow pallor. Countenance stolid. Slight cyanosis of the lips. Striking ammoniacal odor to breath. Sclerae dull. Beginning pterygium in left eye. Impaired hearing in both ears. Teeth all gone. Flexibility of spine limited in all directions. *Heart.* Apex impulse in the fifth space 12.5 cm. to the left. Percussion measurements as shown in the diagram. Sounds of fair quality. Action regular. A blowing systolic murmur at the apex, low pitched outside the nipple line, high pitched toward the midline. Radial arteries sclerosed. Temporals and brachials beaded. *B.P.* 158/88-105/60. *Lungs.* Râles in both axillae and medial to the angles of the scapulae. *Abdomen, genitals, extremities* and *reflexes* showed nothing of importance. *Pupils.* Slow reactions to light and distance. *Fundi.* Disc margins definite. Vessels small and tortuous. Cups well outlined. No exudate or hemorrhages. Macular regions clear.



T. 96.4°-98.6°, with one rise to 99.2° the day of entrance. *P.* 60-100. *R.* 12-24. *Urine.* ℥ 50-30, sp. gr. 1.008-1.010, a trace to a large trace of albumin at all of three examinations, leucocytes at all, loaded at one, red blood corpuscles at two, granular casts at one, loaded with granular, waxy and hyalin casts at another. *Renal function.* No trace of color. *Blood.* Hgb. 55 per cent., leucocytes 10,400-14,600, polynuclears 89 per cent., reds 2,160,000, some achromia. *Non-protein nitrogen* 140.5 mgm. December 12, 142.5 mgm. December 18. *Wassermann* negative. *X-ray.* See illustration.

Orders. December 12. Salt free low protein diet. Rest in bed. Keep warm. Enema tonight. $MgSO_4$ ℥ iss in the morning. Fluids ad lib. Veronal gr. xv in warm milk at 9 p. m.; gr. xv followed by sips of water at 9:30 p.m. December 17. $MgSO_4$ ℥ i every other morning. Lumi-

nol gr. iss, repeat once if necessary. December 19. Veronal gr. x every night p. r. n. December 24. Luminol gr. iss.

The patient felt well at first and had no vomiting. His bowels moved normally. A week after admission he was more drowsy and occasionally vomited. December 23 he was hard to rouse. His speech was thick. There was some muscular fibrillation. Next day he was hyperpneic and complained of aching pain over the heart. December 25 he died.

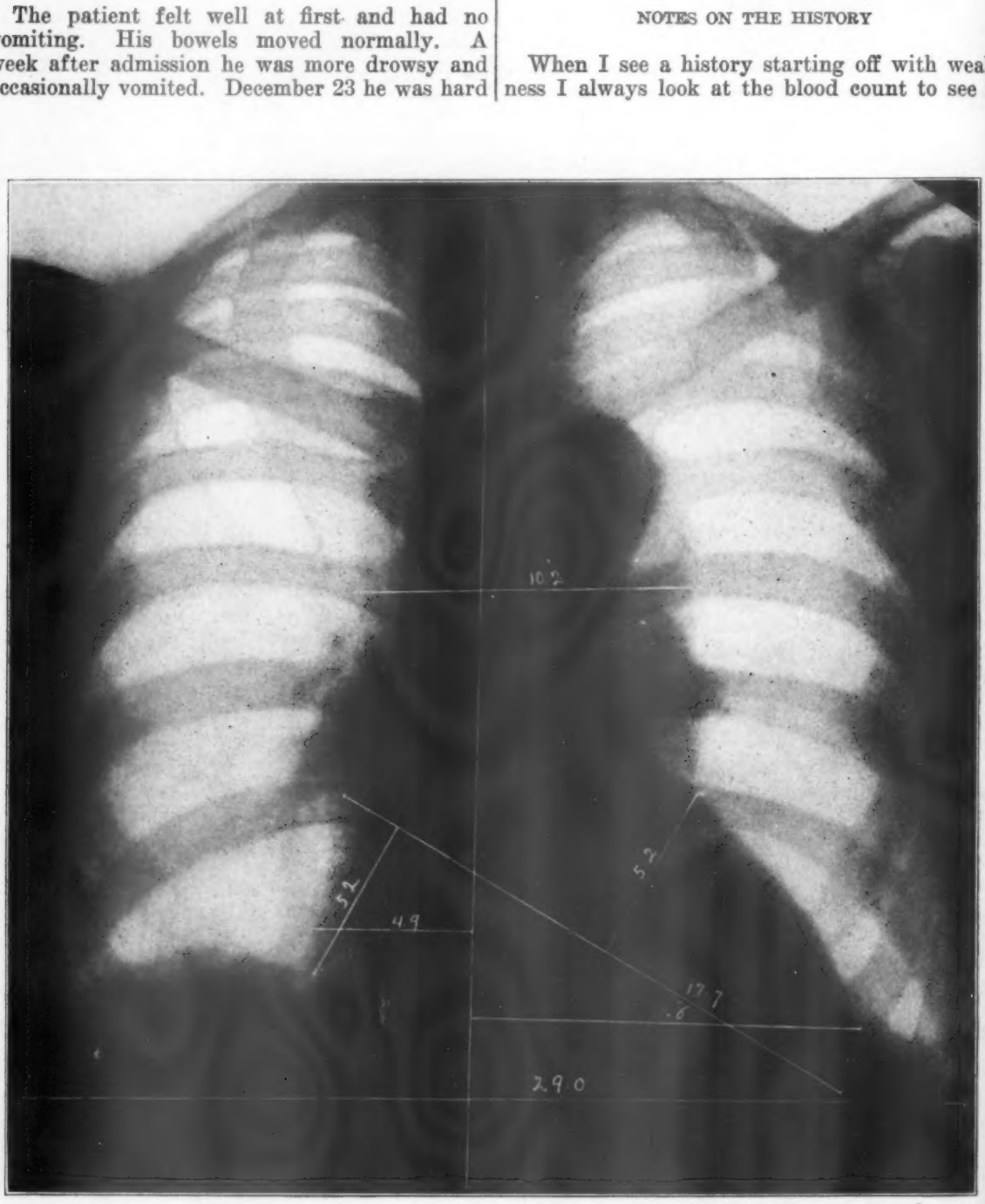
Discussion

BY DR. RICHARD C. CABOT

NOTES ON THE HISTORY

When I see a history starting off with weakness I always look at the blood count to see if it is pernicious anemia. Here I do not get any satisfactory evidence at a glance.

Twenty-five years ago he had no right to have any prostatic trouble, and no other genito-uri-



CASE 10081.

Lungs negative except for a few dense glands at the roots. Heart shadow distinctly increased, almost entirely downward and to the left in the region of the ventricle. Also marked increase in supracardiac dullness. Aortic knob prominent, and in the lateral view the diameter of the aorta is much increased, suggesting that the appearance is largely due to tortuosity of the aorta.

nary trouble has been mentioned to give him any such urinary disturbance. Influenza has no connection that I know with frequent urination.

From this history we should certainly be surprised if we do not find evidence of chronic nephritis. He is at the age when those things happen. He begins with weakness, visual trouble, vomiting; later we hear that he is put on a milk diet; he has pain not accounted for ordinarily by nephritis, but which may be due to the anemia to be expected with such a nephritis as this. At his age the mental symptoms would go perfectly well with a nephritis.

NOTES ON THE PHYSICAL EXAMINATION

Possibly the pains he has been complaining of were connected with some spinal arthritis.

This is not so big a heart as it looks because the nipple is unusually far in. 12.5 cm. is moderately enlarged. The left border on percussion goes outside of the apex impulse.

The blood pressure is surprisingly low, but very probably we are seeing the case toward the end. He lived in the hospital only a day or two. It was probably higher in an earlier period.

We should have expected, from what we have been guessing so far, that there would be changes in the retina. This report is rather surprising.

The gravity of urine rather suggests restriction of the power to concentrate.

I would call attention to what we so often see,—the inconsistency in the presence of achromia and the hemoglobin as measured by the hemoglobin-scale. It is much easier to be sure of the achromia. So when the two conflict it is safer to believe the microscope than the hemoglobin record. If this hemoglobin were correct it would give a high color index, which we have no reason to expect from the rest of the case.

This is the sort of heart which we expect from the other features of the case. By x-ray it measures 16.7 cm. across, and the chest measures 29 cm., so that its size is obviously increased, as we found by percussion.

The orders are the usual ones for nephritis, with some sedatives.

DIFFERENTIAL DIAGNOSIS

I see no reason to doubt that he died of chronic nephritis. Practically we are forced to that by a zero renal function unless we see some reason to suppose a destructive lesion of the kidney such as hydronephrosis or cystic kidney can give.

Can we say anything about the kind of nephritis? I do not see that we can. At his age the arteriosclerotic is a good deal commoner than the glomerular type. But he has had rheumatic fever, that is he has had in his system the organism which most often causes glomerulonephritis, and for all I know it may be that. I have given up the attempt to distinguish between the two.

He should have a hypertrophied and dilated heart. Surely we cannot be wrong on that, with the x-ray measurements. Is there any lesion in the heart? I have no reason to think so. He has a systolic murmur, as all patients with big hearts do.

He should have secondary anemia. There is no reason to look elsewhere for the anemia than to the nephritis itself.

The retention products are high. The only surprising thing is that his fundus shows nothing.

Outside of the main cause of death—chronic nephritis—with the heart that goes with it, have we any reason to suspect anything else? He had at one time a "dyspepsia" relieved by food. We may think of peptic ulcer, which has often been associated with arteriosclerotic nephritis. At one time Moynihan, the English surgeon, tried to distinguish the type associated with kidney disease and called it I think the uremic ulcer. We have no x-ray studies or studies of the feces which would back up such a guess, and so we cannot do more than mention it.

We have nothing in particular to make us suspect disease of the lungs.

What of the nervous system? He has tremor of the hands, his memory fails; at the end he is drowsy. It seems to me uremia and anemia can perfectly well account for all that. He had this bladder trouble, or apparent bladder trouble (urination every hour), but after he gets to the hospital nothing is said about that. So whatever that was, we do not have to deal with it as an active lesion at the present time. We do not have to suppose tabes or any other lesion that would give him incontinence.

A PHYSICIAN: Prostatic enlargement?

DR. CABOT: But it began twenty-five years ago. It is hard to think of a prostate starting as early as that. We do not expect men under forty to have such symptoms. Still, I do not know enough about the prostate to say that it cannot start as early as that.

I think of nothing else. We often find terminal infections in long-standing nephritic cases, but there is no evidence of any such thing here.

A PHYSICIAN: May I ask how the prognosis is affected after we begin to get definite changes in the fundus?

DR. CABOT: I do not think the fundus is one of the most useful prognostic signs. I think the degree of anemia is more useful; it helps us more than the retention products and more than any particular thing in the urine unless it is the renal function by phthalein. Anemia and renal function are the things that help us most in

prognosis. But I have seen people go along a long time with these fundus lesions.

A PHYSICIAN: Would their absence favor possibly the diagnosis of arteriosclerotic nephritis?

DR. CABOT: I do not see that it would. First taking the fundus: it seems to me the changes in the fundus are just as frequent in one form as in the other. He has arteriosclerosis of the aorta. But that after all has not much to do with the question of what there is in the kidney. I should say, just on statistical considerations, considering his age, the arteriosclerotic nephritis is much the more probable here.

A PHYSICIAN: Do you get an enlargement of the heart entirely dependent on hypertension?

DR. CABOT: The cases where we get big hearts are the hypertensive cases; the cases where we do not get them are the amyloid cases. The most consistent correlations are of high blood pressure with hypertension. We get the one with the other practically every time. I believe the blood pressure in this case was considerably higher at an earlier period. When we find a case with hypertrophy and dilatation and nephritis and no high blood pressure we assume that if we had seen it earlier we should have found hypertension.

A PHYSICIAN: How do you account for the drop in pressure here?

DR. CABOT: I have nothing in particular to say. His anemia would tend to weaken everything, cardiac muscle with the rest; but we have not much other evidence of the cardiac muscle giving out. There are many cases that never do drop; they stay high up to the end. I do not know how to say why some do and some do not.

DR. J. H. MEANS: I suppose we can have cardiac weakness without the outstanding manifestations of failure?

DR. CABOT: Yes; that is, it takes time to make itself obvious.

DR. MEANS: I think the blood pressure is a tremendously variable thing anyway. I took readings a little while ago, repeating an observation made here about the effect of straining. Do you know how much you can raise normal blood pressure by a little straining?

DR. CABOT: I know I can by a little running raise mine to over 200.

DR. MEANS: Simply straining down as at stool will raise it from 120 to well over 200 in normal persons. This man's blood pressure was 158. Then it went down to 105/60. Was that just before death?

MISS PAINTER: It was on the 22nd. He died on the 25th.

DR. MEANS: We see a good many patients in the wards who give the history that their doctors have found a high blood pressure in the past and we do not find it. Yet they do not present definite evidence of cardiac failure.

DR. CABOT: In the x-ray plate we see that unusual prominence of the aortic knob that is spoken of in the record. Even an amateur can see that, and I remember how in the early days they used to make diagnoses of aortic aneurism by the dozen until J. Sailer came along and wrote the first article I know of on tortuosity of the aorta and its x-ray knob. He showed how common it is. Then we gave up calling this knob aneurism.

The lungs look clear in this x-ray. There is no evidence of hydrothorax. He breathed and made the diaphragm unclear, but there is no more at the roots than we have a right to expect. This is a seven-foot plate, so we are seeing the actual size of the heart. The second plate, I take it, is not a seven-foot plate and is therefore somewhat distorted. It is rather a better plate because there is less breathing. The knob is sharp cut here, but everything else is just as before. So that we do not need to change in any way, it seems to me, what we have said.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Chronic nephritis.
Uremia.
Arteriosclerotic and hypertensive heart disease.

DR. RICHARD C. CABOT'S DIAGNOSIS

Chronic nephritis.
Arteriosclerosis.
Hypertrophy and dilatation of the heart.
Peptic ulcer?
Secondary anemia.

ANATOMICAL DIAGNOSIS

1. Primary fatal lesions

Arteriosclerosis.
Amyloid nephritis.

2. Secondary or terminal lesions

Chronic adhesive pericarditis.
Slight chronic endocarditis of the mitral valve.
Hypertrophy and dilatation of the heart.
Edema of lungs.
Ulcers of the duodenum.
Wet brain.

3. Historical landmarks

Small area of softening in right caudate nucleus.
Cholelithiasis.
Slight chronic perihepatitis.

DR. RICHARDSON: The pia showed marked infiltration with thin pale fluid, a little at the base, a slight excess at the ventricles. The brain was

a little wet. The vessels of Willis were free, but showed scattered along the walls here and there a moderate amount of arteriosclerosis. The brain on the right side, in about the middle portion of the caudate nucleus, showed a small area of softening.

DR. CABOT: He should have had a hemiplegia.

DR. MEANS: How big was it?

DR. RICHARDSON: Twelve mm. by one and a half cm.

DR. CABOT: I don't see why he should not have hemiplegia.

DR. MEANS: I don't either.

DR. RICHARDSON: The skin and mucous membranes were pale. The skin generally was rather loose, as though weight had been lost. There was a good amount of subcutaneous fat.

The stomach showed rugae well marked, the mucosa rather pale, no evidences of any chronic passive congestion, the pylorus negative. In the duodenum, however, at a point two cm. below the pylorus, there were two ulcers each about seven mm. across, with smooth rounded margins descending to a thin intact base resting over the head of the pancreas. The intestines otherwise were negative except that the mucosa was rather pale.

There were numerous old pleural adhesions on each side generally distributed. The bronchial glands were enlarged, soft and juicy. The lungs showed a very marked edema, as marked as I have ever seen. If we picked up a piece of the lung and pressed it, the fluid in it would spurt up like a fountain.

There was no fluid in the pericardium; there could not be, for both layers were bound together by firm adhesions,—an old chronic pericarditis. The heart weighed 672 grams. This man was well developed and fairly nourished, with a very large frame, so that naturally he would have a heart of good size. The myocardium was of good consistence, generally thick, but with no evidence of myocarditis either macroscopically or microscopically. The mitral valve measured eight cm. The posterior cusp was in good condition, with only a slight amount of fibrosis such as might appear at sixty-two in anyone. But the anterior cusp showed a band of fibrous thickening and at one point in this band a small fibrous nodule the centre of which was calcareous. There was some shortening and thickening of the chordae tendineae. This is one of those cases in the mitral valve where it is very difficult to decide as to whether it is arteriosclerotic or a slight amount of chronic endocarditis. The aortic valve showed the usual amount of sclerosis and changes at the base, which together with the appearances in the aorta we think of as arteriosclerotic. The tricuspid and pulmonary valves were large but otherwise negative. The cavities were increased, dilated on each side, a little in the left ventricle, more so in the auricle, and considerably on the right. The foramen ovale was closed.

The aorta was enlarged, capacious, and showed scattered all along it much arteriosclerosis, fibrous, fibrocalcareous, and areas of atheroma. The ascending thoracic was capacious and nine cm. in circumference. There was not so much arteriosclerosis here as in the other portions. The arch showed fibrous sclerosis, fibrocalcareous and atheromatous areas. The descending thoracic was seven cm. in circumference, and this showed marked sclerosis of the type we have been speaking of. The abdominal portion was seven and a half cm. The measurements are usually two cm. less than this; when the ascending thoracic gets up to nine cm. it is quite capacious. The great branches, especially the common iliacs, showed much sclerosis. A well marked case of arteriosclerosis. In the abdominal portion on a fibrocalcareous atheromatous base was a well established thrombotic plaque. Sometimes bits of these plaques wash off. They could not in this case because the surface was smooth and intact—organization enough to hold it there.

The liver weighed 1980 grams,—a good sized liver showing a few old adhesions extending from the right lobe to the diaphragm,—a certain amount of perihepatitis. The tissue of the organ was punky, dark cinnamon brown, a little homogeneous. The branches of the hepatic artery showed sclerosis. That brings the arteriosclerotic condition even into the branches in the liver tissue. For some reason I cannot find the section of the liver which should have been taken.

The gall-bladder contained three stones, blackish green, pyramidal, 1 cm. in diameter, which crushed under the thumb,—typical gall-stones. The mucosa of the bladder was negative. The bile-ducts were free, the pancreas negative, the duct of Wirsung free.

The spleen weighed 120 grams and showed a smooth surface. There was slight increase of the consistence, and the cut ends of the vessels showed arteriosclerosis. Here again the piece I meant to have taken is lost.

The kidneys weighed 200 grams. Those are small kidneys. The capsules came off easily, leaving very granular surfaces. The tissue was tough, the markings lost, and the cut ends of the vessels showed fibrosis. The cortex measured one to three mm. A typical picture grossly of what we call arteriosclerotic nephritis. But in addition to that there was extensive amyloid nephritis, and that is why we miss the liver and spleen sections. Of course when amyloid is present we usually mean to take a piece of the liver and spleen. From the description of the liver there might have been some amyloid in it.

The prostate, seminal vesicles, testes, negative.

Culture from the heart blood showed no growth.

At the time of necropsy I found none of the usual things with which we associate amyloid, such as syphilis, tuberculosis, chronic suppuration. But every once in a while we find amy-

loid nephritis associated it may be with nothing else, or as in this case with arteriosclerosis or even sometimes when the nephritis has more the character of glomerulonephritis.

A PHYSICIAN: Do you think the widely dilated aorta would have anything to do with the low blood pressure?

DR. CABOT: I should not think so. We see high blood pressure with a very big aorta often. The rule in blood pressure cases is a dilated aorta.

It is interesting that the case has the peptic ulcer which we could not make more than a guess at. He did not seem to be suffering from it when he came here. He was suffering so much from other things that I think they were perfectly right in not putting him through the mill and giving him gastro-intestinal x-ray studies. Two or three of these cases have come to light in my memory through quite frank hemorrhages, gastric or intestinal, even though there had been little else to make us suspect.

DR. MEANS: It occurs to me that the explanation of the low blood pressure might be something like this. The anatomic picture in the kidney is the kind we ordinarily associate with hypertension. This kind of kidney demands a high tension to function properly. As the blood pressure drops the kidney ceases to function properly, and the low blood pressure means ceasing function and death.

DR. CABOT: We do see cases where the blood pressure does not come down.

DR. MEANS: Yes, but it would appeal to me that if the blood pressure did come down, if the heart could no longer maintain the high blood pressure, we might expect uremia to develop. In order to get proper circulation through the damaged glomeruli an increased pressure is necessary.

DR. CABOT: Yes. That is one of the reasons why we do not want to diminish high blood pressure. We hear every month or so of some eminent physician who has found a method to reduce high blood pressure, a mechanical method or a pharmacal method. The thing that seems to me clear in some of these cases is that if we did really reduce it and keep it down we should take a considerable chance of killing the patient.

DR. MEANS: That is true in high blood pressures that are dependent on renal disease, but in those that are not it would be all right to try to reduce it. The only difficulty is that no satisfactory method has been discovered yet to do it.

A PHYSICIAN: Do you think this ulcer had anything to do with his nephritis?

DR. CABOT: I should not think so. In any case of chronic arteriosclerotic nephritis one may guess, if there are stomach symptoms as there are here, that there is ulcer, as we know the association of those two; but it is not a causal association.

A PHYSICIAN: What is the significance of the pericarditis?

DR. CABOT: I do not believe it had any. There was no mediastinitis with it. Ordinarily a pericarditis not associated with mediastinitis does not hinder the work of the heart.

DR. RICHARDSON: Yes, there was some. It was not one of those cases with massive adhesions.

DR. CABOT: The extent to which a pericarditis does any harm is measured by the amount of adhesions outside the heart.

A PHYSICIAN: In regard to etiology, is that evidence that he had rheumatic infection?

DR. CABOT: It is evidence, but not very strong evidence. We see pericarditis from septicemias of various types in later life.

CASE 10082

An American of seventy-two, formerly an auditor, entered November 4 complaining of weakness.

F. H. Excellent, except that his father died at seventy-five of paralysis. His wife had one miscarriage shortly after marriage.

Habits. He smoked two or three cigars and six cigarettes a day and averaged two cocktails or drinks of whiskey or brandy daily for years. He now takes an occasional drink. He usually slept fitfully.

P. H. He had measles, chicken-pox and mumps in childhood, scarlet fever at sixteen, pneumonia at thirty. At forty-nine he was struck in the left ear by a golf ball; he was unconscious and lost his hearing in the ear. The hearing in the right ear was impaired. Years ago he had an unsuccessful operation for hernia. He had occasional headaches. Eight years ago he had a severe nosebleed at night. He urinated six to eight times by day, three to four at night. He thought the amount at night was as great as or greater than that by day. There was occasionally slight difficulty in starting the stream. For a long time he had had a tendency to gaseous eructations after meals. For some time he had had dry hacking cough, occasionally with a little yellowish sputum. His appetite had been only fair, his bowels slightly constipated. For fifty-six years he had worked under a good deal of nervous tension and worry. His weight had been about 200 pounds for years.

P. I. September 25 he fell down, struck the left side of his head, and became unconscious. His left eye was blackened, his upper lip cut, and his chin bruised. When he regained consciousness he had dull headache and aching pain in the back of his neck. He was taken home in

an ambulance and rested the remainder of the day except for going out a block for meals. September 27 had his meals served in his room. Except for weakness, dull headache, more on the left, the aching in the back of the neck, and slight constipation he felt fairly well and was up and about the room. September 29 he became markedly weaker and remained in bed. At admission weakness was the most pronounced of the symptoms.

P. E. A red-faced, rather talkative and nervous old gentleman, unable to sit up, answering questions slowly, and tiring easily. Lips cyanotic. Teeth, a few old roots. *Heart.* Apex impulse not found. Pulses normal. Artery walls palpable and tortuous. *B.P.* 190/110-175/110. Sounds not of good quality. Action normal. A rough systolic murmur at the aortic area and a blowing systolic murmur over the precordium. *Lungs* normal. *Abdomen* normal except for a very large irreducible inguinal hernia. *Rectal examination.* Small thrombosed hemorrhoids. *Extremities, genitals, pupils* and *fundi* normal. *Reflexes.* He did not often move his left arm, but could do so. Grip weaker on the left. Biceps and triceps slightly more active on the left. Slight Babinski, left.

2½	10	3½

T. 98°-100.5°, *P.* 73-102 with terminal rise, *T.* 100°-105.5°, *P.* 92-129. *R.* 15-40. *Urine* normal. *Renal function.* Appearance 20 to 30 minutes late; 15%-20%. *Blood.* Hgb. 80%, leucocytes 8,300, polynuclears 83%; no marked abnormality of reds or platelets, a rare young polynuclear seen. *Non-protein nitrogen* 40 mgm. *Wassermann* negative. *X-ray.* No evidence of fracture made out in skull.

Orders. November 4. Bed, with head rest in p.m. Salt free low protein diet. $MgSO_4$ ℥ i in a.m. Veronal gr. v. November 6 and 7. Veronal gr. x. (Not necessary.) November 10. Caffein sodium salicylate gr. vi s.c., repeat every two hours p.r.n. November 14. Caffein sodium salicylate gr. vi s.c. Morphia gr. 1/6 s.c. every four hours p.r.n.

The patient did very well for the first five days. November 9 his pulse became very weak. The next day he was put on the dangerous list. November 12 he was drowsy and weak. Two days later his mental processes were much retarded. He was unable to speak. He grew increasingly comatose. With the terminal rise in the chart there was a change for the worse. November 21 he died.

Discussion

BY DR. PAUL D. WHITE

NOTES ON THE HISTORY

I should not think his father's death would change the status of the family history very much.

People who advocate tobacco would say that this indicates that tobacco aids long life; just as well others would say that if he had not smoked so much he would have lived longer than seventy-two. The same claims are made about the use of alcohol. In other words, we cannot argue either way from these habits of tobacco and alcohol.

The record does not say when the hearing in the right ear was impaired. Probably that was a much later occurrence than the accident.

In view of some degree of hypertension, as we shall see later, this nosebleed may be of some significance.

His difficulty with urination and increase in amount at night would suggest two things, a large prostate, and also some degree of nephritis, although we should like to know how much the total output of urine was. Is there a record of that?

Miss Painter: In the ward it was twenty-seven to thirty-four ounces.

Dr. White: In the case of an old person we always like to know more in detail about such an accident as this of September 25,—whether the fall resulted from slipping or may have been the result of a cerebral accident itself.

Miss Painter: He thought he tripped.

Dr. White: Apparently he felt himself that this was an accident. The fact that he was able to go out a block for meals shows that he could not have had much paralysis. He was admitted to the hospital about six weeks after his fall.

NOTES ON THE PHYSICAL EXAMINATION

In this examination of the heart there is no mention of thrill, so that this murmur is probably the kind often heard in arteriosclerosis with some dilatation of the aorta.

These changes in the reflexes are wholly left sided, and yet there is no note of any change in the pupils or face.

Was this last temperature on the final day?

Miss Painter: Yes, it was a terminal rise.

Dr. White: He had two days of temperature before going to 103°. Was the leucocyte count made at the time he was having his fever?

Miss Painter: That was made on November 5.

Dr. White: The day after he came in; and he had the rise November 21. Is there any note as to why the caffein was given November 10? Was he having respiratory difficulty?

MISS PAINTER: There is nothing in the record.

AN INTERNE: He was semicomatose. There was no definite respiratory difficulty, but we believed he should have caffein instead of morphia.

DR. WHITE: Did he react to the caffein?

AN INTERNE: No.

DR. WHITE: Did his lungs stay clear to the end?

AN INTERNE: There were scattered râles during the last few days.

DIFFERENTIAL DIAGNOSIS

DR. WHITE: The story begins of course with an accident, and ends in a very slow but steady failure from September 25 to his death two months later. The chief symptoms were weakness and finally drowsiness and coma. Was he comatose for several days before he died?

AN INTERNE: Yes, he was comatose and incontinent for about three weeks.

DR. WHITE: Was there any change in the reflexes?

AN INTERNE: We could not get any change in the reflexes. On the 14th he was conscious and seemed to understand, but could not speak. During the last week he went downhill.

DR. WHITE: Was there any change in the pupils or reflexes?

AN INTERNE: We could not get any change.

DR. WHITE: The difficulty with the left arm and the Babinski were not very definite?

AN INTERNE: No. He seemed to have a disinclination to use that side, but he could use it.

DR. WHITE: It seems to me that we have to make a diagnosis of arteriosclerosis here. I feel very sure that arteriosclerosis involving the heart, kidneys and brain will be evidenced. I should say that he would show a large heart with the coronaries sclerosed, the increase in size probably the result of hypertension which he has probably had for years, although I have no idea what degree of hypertension there may have been previously. We have simply the record of 190/110 and 175/110. His kidneys will also probably show arteriosclerotic involvement. He should have an enlarged prostate.

Then we come to the question of cerebral lesion,—just where and how much there may be, the result of the trauma. The fall may have given him some hemorrhage or started a thrombosis. It is not typical of any extensive lesion which would produce paralysis, or change in reflexes. But we are very apt to find thrombosis or hemorrhage on the right, quite possibly with softening of the brain on the right. We cannot be very definite about that from the story.

Very likely there is a terminal infection, although we have not very much to base our diagnosis on except the temperature for the last three days. Possibly it is a bronchopneumonia.

DR. CABOT: You would not think, would you, that what we have recorded here in his heart is sufficient to kill? He does not seem to have any arrhythmia.

DR. WHITE: No. There is no failure, no obvious edema.

DR. CABOT: That is, something happened there on September 25th, when he was going along well enough. But for that, I take it, he would have lived along, as far as heart or kidney were concerned. So that I shall be very much surprised if they do not find a brain lesion as the cause of death. Of course the terminal infection he did not have when he came.

In the cases of old men with heart symptoms in these exercises I have been struck with the frequency with which we get cerebral lesions with little to show for it—that is, how often the cerebral hemorrhage is of the type that does not make a clean-cut hemiplegia.

DR. WHITE: Would you think that hemorrhage is more probable than thrombosis?

DR. CABOT: No, I have no opinion between the various vascular lesions, thrombosis, hemorrhage, softening. I do not believe any person can tell.

DR. WHITE: Would you care to tell just where it is?

DR. CABOT: No more than that it is on the right side.

DR. WHITE: That is the way I feel.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Cerebral hemorrhage.
Bronchopneumonia.

DR. PAUL D. WHITE'S DIAGNOSIS

Arteriosclerosis.
Hypertrophy and dilatation of the heart.
Cerebral hemorrhage or thrombosis.
Terminal infection.

ANATOMICAL DIAGNOSIS

1. *Primary fatal lesions*

Chronic internal pachymeningitis with extensive hemorrhage.

2. *Secondary or terminal lesions*

Slight arteriosclerosis of the vessels of Willis.
Arteriosclerosis.
Hypertrophy and dilatation of the heart.
Small dissecting aneurism of the abdominal aorta.
Small area of hypostatic pneumonia in lower lobe of left lung.
Slight chronic passive congestion, general.

3. Historical landmarks

Chronic pleuritis, right.
Chronic perisplenitis, slight.
Right inguinal hernia.
Atrophy of the right testis.

DR. RICHARDSON: On sawing through the skull cap considerable blood ran out from the cut, more than we should expect,—the first hint that there was a hemorrhage of some sort inside. In the situation of the right hemisphere there was a mass of blood clot and blood extending from the anterior fossa back to the posterior and pressing on the whole side of the right hemisphere with marked depression of the brain in this region. The blood clot was enveloped by a thin vascular membrane, the dura was thickened, and this membrane was more or less adherent to it. In short, a very marked case of chronic internal pachymeningitis with very great hemorrhage. The brain otherwise was negative. The brain was kept in the refrigerator for three days and by that time had resumed its normal contour. The vessels of Willis showed only a very slight amount of fibrous sclerosis. The middle meningeals were negative.

The aorta showed well marked arteriosclerosis with a small dissecting aneurism of the lower part of the abdominal portion and considerable sclerosis in the great branches.

The heart was enlarged, weighing 555 grams, associated of course in this case with the arteriosclerosis. The coronaries were free, capacious, and showed only a slight amount of fibrous sclerosis.

The kidneys were rather small, but macroscopically and microscopically showed no nephritis.

The lower lobe of the left lung showed a small area of hypostatic pneumonia.

A blood culture taken at the necropsy was negative.

On the right side was a rather large inguinal hernia, generally free, but adherent at the lower portion of the mass to the wall of the scrotum. The hernia included the cecum, appendix, omentum and a long strip of the lower end of the ileum.

There was a slight amount of chronic passive congestion.

DR. CABOT: This diagnosis of pachymeningitis is one that we used to hear more about than we do now. Clinicians used to try to make the diagnosis. I think they have more generally given it up now. We used to hear that alcoholics were particularly prone to it. There is a fair amount of alcoholism in this case; but we see many alcoholics who do not have it, and we see a good many cases that do have it and are not alcoholic, so that I do not think we have enough evidence to say that it has any definite relation to alcohol. It has no definite clinical picture that I know. I do not believe we can do any more than recognize it in this way postmortem as a pachymeningitis.

I think the only diagnosis we could make here is the one that Dr. White made. That was the only logical one to make, and the one that we have got to make next time. In making such a diagnosis one hundred times we shall be right about eighty times.

The other point that I want to make is about râles in the lung. In a case of this kind this symptom is useless as differentiating between brain and heart. We get just as many with the brain lesions as with heart lesions. That is not true at all of peripheral edema; but there is something involved in cerebral hemorrhage and many other comas that fills the lungs up with râles. Even in young men where the thing is wholly traumatic we find the lungs stuffed with râles as the result of cerebral injury. Hence when we find râles in the lungs in a case where there is doubt between lungs and brain, we should not say that râles mean heart or kidney as a cause. They are just as likely to mean brain.

A PHYSICIAN: If arteriosclerosis was not back of this pachymeningitis, what in your opinion was?

DR. RICHARDSON: The usual thing would be some inflammatory process. Other than that or processes in the skull or injuries we do not know.

DR. AUB: This man had an accident.

DR. CABOT: I believe that this man did not fall down and hurt himself, but had something go wrong in his brain—namely this hemorrhage—and fell down,—fell down because of his hemorrhage rather than had his hemorrhage because he fell down. It seems to me the way it is told suggests that. He would not have bruised himself as much as he did if he had not been unconscious when he struck the ground. So I do not believe the trauma had anything to do with the pachymeningitis in this case. But we do not really know much about the etiology. It is a pretty dark subject.

DR. AUB: Doesn't pachymeningitis give headache?

DR. CABOT: I do not believe we can show that. I think we see a lot of cases without headache. I tried hard years ago to get some sort of clinical basis for this diagnosis, and I do not believe we can do it.

A PHYSICIAN: Should not they have had some evidence of increased pressure, like choked disc?

DR. CABOT: Just from the hemorrhage itself? The relation of choked disc to cerebral hemorrhage is a thing I have not been able to understand—why we get it in some cases and do not get it in others with cerebral hemorrhage.

A PHYSICIAN: If he had enough to make him fall down wouldn't it be strange for him to recover so quickly?

DR. CABOT: As Dr. Richardson draws the lesions of this case one would say he *must* have

a hemiplegia. This is an astonishing case—a big hemorrhage squeezing the brain down, and yet the patient able to move his left arm and left leg. Neither his motor nor his cerebral functions show anything like what we should expect to see. But it seems to me that in old men as we observe them here all that is not uncommon.

DR. G. C. CANER: Doesn't hemorrhage usually destroy the brain cells in a short time?

DR. CABOT: Yes, and here there was no destruction, apparently only pressure. Was that because of the limiting pia membrane? That is an interesting suggestion. Perhaps that has something to do with the reason he did not have hemiplegia—the cells were there, not destroyed.

DR. CANER: The brain would not have been likely to come back if it had been there for months.

DR. RICHARDSON: The brain seems to be able to stand pressure pretty well even when there is new growth pressing on it. From what has been said I should think the symptoms referred more to cortical than to central things.

DR. CABOT: Yes, there was coma and unconsciousness rather than paralysis. There was no definite paralysis. There was Babinski and poor motion in the left arm. I think that is a very interesting point,—that the brain cells apparently were not destroyed. The other point is whether the brain could have come back after a month of pressure. Could the blood have been there a month?

DR. RICHARDSON: I should think some of it might have been.

DR. CABOT: Can we get any evidence as to whether this hemorrhage had just come on at the end of life, or whether it had come on at the time of his fall?

DR. RICHARDSON: There is chronic pachymeningitis.

DR. CABOT: What is your guess as to how long the blood had been there?

DR. RICHARDSON: Some of it must have been there for some time. The remarkable thing here is the extent of the hemorrhage. There is as a rule a certain amount of bleeding, not usually very extensive, in cases of chronic internal pachymeningitis. Usually it has nothing to do with death. In this case the hemorrhage happened to be extensive enough to kill him. Just when the bulk of it occurred of course is a question for academic discussion.

CASE 10083

A Swedish clerk of fifty-five entered July 14 for study of numbness and pain in the legs of thirteen months' duration.

F. H. Good as far as known.

Habits. Good.

P. H. Negative. He denied venereal disease by name and symptoms, but admitted exposure.

P. I. Thirteen months ago he first noticed numbness in both legs and dull pain around the umbilicus coming on just after meals. The numbness had persisted, but for two months he had had no abdominal pain. From the onset he had been so weak and tired out that he had to give up work. For a year he had spent most of the time in bed. A month after the onset of the symptoms he began to have diplopia, tingling and dull aching in the calves of the legs, nycturia twice a night, and occasional vomiting. Soon after this he had dull pains and tingling in the thighs. At times there was a tight girdle-like sensation around the chest. After two months the diplopia ceased, and had not recurred. For the past few months there had been dull bone pain in both shoulders. When he walked his feet felt like lead and gave out. Six weeks ago for three weeks he was delirious once or twice a day for two or three hours and was incontinent of urine and feces. Three months ago he had edema of the feet and legs up to the knees and of the face and neck, lasting two weeks. Three weeks later he had a second attack. The present pains in the legs he described as a dull ache and a tingling feeling like the pricking of needles and pins. When he walked his feet felt as though asleep. He was quite unsteady on his feet, and had fallen several times. He had lost thirty or thirty-five pounds in a year.

To another house officer July 20 the patient gave the following history. Fourteen months ago he did not feel well and began to notice numbness in the feet, legs and fingers. A few weeks later he became ill, and later delirious. Nine months ago he had another attack of illness during which he had high fever, delirium, rapid loss of weight and abdominal pain or discomfort immediately after meals. He had black diarrhea for three weeks. Since this attack his stools had been pale, not white. Since the first of the year he had been gradually improving subjectively, though still losing weight and strength. Following any kind of exertion he developed edema of the extremities, face, etc.

P. E. A sallow, lethargic, old-looking man showing evident loss of weight and atrophy of the muscles, especially those of the shoulders and arms. Decayed teeth. Marked pyorrhea. Injected pharynx with cryptic tonsils. Whole spine fixed and straight. It was difficult to distinguish the various spines of the vertebrae. Both anterior and lateral motions limited. All superficial lymph nodes large and shotty. Apex impulse of the *heart* felt in the sixth space. No enlargement to percussion. All superficial arteries somewhat thickened and sclerotic. *B.P.* 120/70-160/70. *Lungs.* Hili enlarged to percussion, especially posteriorly. Breath sounds

distant over back and sides. *Abdomen* and *genitals* normal. *Pupils* slightly irregular. Left greater than right. No reactions. *Reflexes.* Knee-jerks absent. Questionable Babinski. Romberg positive. *Neurological examination.* (Additional findings.) Cranial nerves normal. Pupils, no consensual reflexes. Very sluggish. Muscles of both shoulder girdles atrophic. Dullness at both isthmi. Sluggish biceps and triceps. Questionable mass to left of umbilicus. Absent cremasterics and abdominal reflexes. Hand grip weak, left more than right. Interosii of both hands weak, more on the left. Right forefinger and middle finger thick and very stiff. Legs spastic, especially on extension. All motion difficult because of general stiffness and spasticity. Passive motion unaffected. Extensors weaker than flexors of forearms. No loss of sensation found anywhere, or difficulty in finer movements, as picking up pins, etc. Heel-knee and finger-nose tests performed well. No adiodokokinesia. *Reports of consultants. Laryngologist.* Sinuses light well. Septum irregular, not obstructive. Tonsils small, submerged, with congested pillars; contained detritus. These might well be foci. *Dentist.* "Several old tooth roots and devitalized teeth. Foci unquestionably present. Advise complete set of dental x-rays, then extraction of diseased teeth and roots." *Surgeon.* "Advise operation."

Before operation *T.* and *R.* not remarkable, *P.* 61-90; *urine,* normal amount, alkaline, sp. gr. 1.018, no albumin; *blood,* hgb. 60%, leucocytes 16,400, polynuclears 70%, fragmented cells 2%, reds 3,120,000-3,000,000 very marked anisocytosis, moderate poikilocytosis and some achromia. *Wassermann* negative. *Non-protein nitrogen* 41.4. *Stools* grayish at one of three examinations, guaiac positive at two of three examinations. *Lumbar puncture.* Clear fluid. Pressures 135, 115, 100. Jugular compression 230 (rapid and free). Cough 80. Pulse 3. Respiration 10. Two cells. Alcohol very slightly positive. Ammonium sulphate slightly positive. Gold solution, benzoin mastic and Wassermann negative. Total protein 67. *Gastric analysis. Fasting contents.* 20 c.c. clear watery material with flakes of undigested skin fibres, etc. Fat droplets on top. Guaiac positive. Lactic acid strongly positive. Total acid 20%. No free acid. *Test meal.* 15 c.c. starch granules plus skins and undigested food. Guaiac strongly positive. Lactic acid strongly positive. Total acid 30%. No free acid. Microscopic examination of both fasting contents and test meal showed many actively motile, large, slender bacilli, many yeasts, starch granules, shreds of muscles, vegetable fibres, husks, mucus and various cells of the epithelial type. The test meal showed much more starch. Smear, very large number of Gram-positive slender, long bacilli, single and in chains, probably Oppler-Boas bacilli, many yeasts, numerous epithelial cells. *X-rays.* Lumbar spine showed hypertrophic changes.—Apex of the left lung less radiant than that of the right. Diaphragm high on the left with limited expiratory excursion. Also some increase in the hilus shadows. A few dense glands present.—Left antrum less radiant than right. Its density disappeared when the head was strongly tilted back, suggesting the possibility of fluid in the antrum.—Buried root in the left lower first molar region, also evidence of pyorrhea.—Stomach contained whole meal at six hours; low and atonic. Peristalsis deep and sluggish. Nothing passed the pylorus during observation. Outline of pyloric end of stomach smooth and showed no definite evidence of involvement of the gastric wall.

Orders. Anemia diet. Ambulatory p.r.n. $MgSO_4$ ʒ i. Nux vomica and gentian compound* ʒ i t.i.d. July 21. Blaud's pills t.i.d. p.c. July 25. Internal medicine† ʒ i t.i.d. before meals. Digitalis gr. iss p.c. for three days. July 29. Digifolin three ampules. Digitalis gr. ivss by mouth, then digitalis gr. iss t.i.d. by mouth; then notify house officer; also notify if pulse 75-70. Morphia gr. 1/6 s.c. July 30. Scopolamin hydrobromid gr. 1/200 s.c. July 31. Digitalis gr. iss t.i.d. Dilute hydrochloric acid minims xv p.c. August 1. Digitalis gr. iss 2 i.d.

July 20 palpation of the abdomen during discomfort an hour after supper disclosed moderate rigidity, which decreased in twenty or thirty minutes, leaving only the right side spastic, especially in the upper quadrant. The patient complained of slight pain to the left and even with the umbilicus on palpation. The spasticity disappeared an hour after the observation began. The patient was much depressed. July 24 the pupils reacted well to accommodation.

July 28 operation was done. The patient was sent back to the ward in poor condition. He made a poor ether recovery. Two days later he was in a critical condition. He had stertorous respiration and râles throughout both chests. There was gangrene of the left lower leg. Next day he had pneumonia. That day, July 31, he died.

Discussion

BY DR. HUGH CABOT

This patient has a long and complicated history not easy to match entirely with the findings. Most of his symptoms have suggested some nerve lesion, but are perhaps most easily accounted for upon the assumption of a high degree of arteriosclerosis coupled with disease of the stomach.

The physical examination shows marked evi-

*Tincture nux vomica ʒ ii, tincture gentian compound ʒ i, water to make ʒ iv.

†Strychnin sulphate gr. ¼, dilute HCl ʒ i, elixir of gentian to make ʒ vi.

dence of chronic hypertrophic arthritis for which no very satisfactory foci were found. I think it doubtful whether the condition of the teeth would account for it.

His variable blood pressure is not incompatible with arteriosclerosis. The most definite findings clearly relate to the stomach, which shows a high degree of retention, absence of free hydrochloric acid, and an x-ray picture which does not clearly suggest malignant disease. On the whole I think the most probable diagnosis is a benign ulcer of the duodenum which has contracted so as to produce a high degree of obstruction.

For this difficulty operation is clearly indicated, but it must be admitted that he is a poor subject for operation and that even if successful he might not be returned to any very high degree of health. I have no doubt that operation ought to be done, but I should undertake it without enthusiasm and should feel required to suggest either to him or his family that miraculous cure would be unlikely to follow. It seems to me pretty clear that no very extensive operation ought to be undertaken and that probably a simple gastroenterostomy would fulfill the indication.

DR. CABOT'S PRE-OPERATIVE DIAGNOSIS

Chronic ulcer of the duodenum with obstruction.

PRE-OPERATIVE DIAGNOSIS

Pyloric obstruction.

OPERATION

Gas and ether. Right rectus muscle splitting incision. A tremendously dilated stomach was found half filling the abdominal cavity. In the region of the gall-bladder there was a hard inflammatory mass involving the pylorus. This felt like inflammation rather than malignant disease. No attempt was made to free the pyloric region. A posterior gastroenterostomy was done. This drained the distended stomach.

FURTHER DISCUSSION

They apparently recognized that he was a poor subject and did all they could to bolster up his circulation by the use of digitalis.

The story after operation is that of a patient who was unable to withstand even the least extensive operation upon his stomach. The gangrene of the left leg may be assumed to be due to closure of the femoral artery, probably at its bifurcation into the popliteals. The immediate cause of death was probably pneumonia, a common cause of death in these cases of debilitated patients who require operation for lesions of the right upper quadrant.

Necropsy should show a high degree of arteriosclerosis, obstruction to the outlet of the stomach probably due to benign ulcer of the duodenum, embolism of the left femoral artery and bronchopneumonia.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Tabes.
Carcinoma of the stomach.
Operation, posterior gastro-enterostomy.
Bronchopneumonia.

DR. HUGH CABOT'S DIAGNOSIS

Arteriosclerosis.
Chronic benign ulcer of the duodenum.
Embolism of left femoral artery.
Bronchopneumonia.

ANATOMICAL DIAGNOSIS

1. *Primary, fatal lesion*

Ulcer of the pylorus.

2. *Secondary or terminal lesions*

Purulent bronchitis.
Bronchopneumonia, left lung.
Acute pleuritis, left.
Edema of the lungs.
Arteriosclerosis.
Mural thrombi of the aorta and the left common iliac artery.
Embolic occlusion of the popliteal artery.
Beginning gangrene of the left foot and leg.
Cholelithiasis.
Chronic pericholecystitis binding the gall-bladder to the walls of the stomach and duodenum in the region of their junction.
Wet brain.

3. *Historical landmarks*

Operation wound, gastroenterostomy.
Obsolete tuberculosis of a bronchial lymph node.
Slight chronic pleuritis.

DR. RICHARDSON: The examination of the head showed a wet brain and pia with slight sclerosis in places along the walls of the vessels of Willis.

There was beginning gangrene of the left foot and leg and embolic occlusion of the popliteal artery.

A gastro-enterostomy was established between the stomach and the jejunum by the posterior route. The anastomosis was free and in good condition. At a point on the pyloric ridge postero-laterally to the right there was an ulcer 2½ cm. by 1 cm., the irregularly round margin

of which overhung slightly and descended to a very smooth intact base.

The gall-bladder was firmly bound to the pyloric wall in the region of the base of the ulcer by very firm old adhesions. The duodenum and small intestine elsewhere and the large intestine were negative.

There were a few old pleural adhesions. The trachea and bronchi contained much mucopus and the mucosa showed dirty reddish discoloration. The bronchial glands were moderately enlarged and one of them showed much fibrocalcareous degeneration,—obsolete tuberculosis.

Left lung. The upper lobe showed considerable edema. The pleura over the middle portion of the lower lobe showed small patches of fibrinopurulent material and several areas of bronchopneumonia. The tissue of this lobe showed much edema.

Right lung. The tissue generally showed much edema. There were no areas of consolidation.

The pericardium and heart were negative.

The aorta above the diaphragm showed a moderate amount of fibrous sclerosis with small areas of fibrocalcareous change here and there. The abdominal portion showed a moderate amount of fibrous sclerosis and several smaller and larger areas of fibrocalcareous change. Over one of these fibrocalcareous areas there was a frank adhering thrombotic patch 2½ by 1½ cm. by 5 mm. thick. A little below this in the left common iliac there was an area of fibrocalcareous change and a small mural thrombus resting over it of about the same size as the other. In the popliteal an embolic mass obstructed the artery. The great branches of the aorta elsewhere showed some fibrous sclerosis. The pulmonary artery, veins and venae cavae were negative. The portal vein and radicles were negative.

The liver was negative.

The gall-bladder was small, contracted, and its walls were closely applied to an ovoid stone 2½ by 1½ cm. The surface of the stone was greenish black and a little rough. It crushed under the thumb and showed dark greenish brown crystalline material. The wall of the gall-bladder was thickened and was firmly bound to the region of the junction of the stomach and duodenum by old adhesions as mentioned. The mucosa of the bladder was smooth and showed no ulcerations. The bile ducts were negative. The pancreas, duct of Wirsung, spleen, adrenals and kidneys were negative. The bladder, seminal vesicles, prostate and testes were negative.

The culture from the heart blood showed no growth.

FURTHER DISCUSSION BY DR. CABOT

I do not see that the necropsy findings developed anything of first class importance not foreseen.

The existence of cholelithiasis probably had no bearing upon the outcome. The gangrene of the leg was evidently of embolic origin.

All things considered, particularly in view of the postoperative embolism, the fatal outcome was perhaps the most desirable result.

Book Reviews

Nutrition and Clinical Dietetics. By H. S. Carter, P. E. Howe, and H. H. Mason. Philadelphia and New York: Lea and Febiger. $7.50.

The book is divided into four parts. In the first part a general account is given of foods and normal nutrition. In the second there is a critical analysis of foods, which includes the vitamin content. The third describes the principles and practice of feeding infants and children. And the fourth, which is very comprehensive and detailed, enumerates the diets to be used to feed patients in all conditions of disease. In this part of the book feeding of patients with diabetes mellitus is very fully described. The ketogenic and antiketogenic theory, the Allen treatment, and some of Joslin's contributions are given, but only a little is written about the relation of insulin to diet. At the end of this part there are good tables of food values, weights and measures. The authors have put together in an orderly arrangement an immense amount of material on the subject of nutrition, and many references are inserted. They take a commendable point of view in the preface by stating that they are "conscious of the fact that dietetics is far from a mature science." With advances in the knowledge of nutrition it is very probable that the extensive elaborations of diets in the treatment of disease will become much simplified and of greater significance.

Diagnostic Methods. By H. T. Brooks. St. Louis, Mo.: C. V. Mosby Co. 1923. Pp. 106. $1.75.

This concise book gives the essential points in taking a history, and the details of a complete physical examination; but most of the text describes briefly the methods and interpretation of laboratory examinations. The new methods of blood chemistry for estimating the sugar, nonprotein-nitrogen, etc., are unfortunately omitted. The microscopic test for fat in the feces is not given. The Lange colloidal gold test is too elaborate and intricate, and the complement-fixation test for gonorrhea is not sufficiently accurate to be included in a book of this kind. With these exceptions the work is a good outline for students and general practitioners.

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JOHN PRESTON SUTHERLAND, M.D., Sc.D.

ON the ninth day of February, John Preston Sutherland, M.D., Sc.D., Dean Emeritus of Boston University School of Medicine, completed the seventieth year of a life which has been devoted to broad service to the community. In commemoration of this event, his friends and colleagues dedicate to him this number of the JOURNAL as embodying a concrete expression of their respect, admiration and affection.

Born in Charlestown, Massachusetts, of Scotch parents, he derives from a line which includes that John o'Groats whose name designates the northeastern-most corner of Scotland.

He was educated in the public schools of Boston, later receiving his professional training in Boston University School of Medicine. On his graduation he married Evelyn Greenleaf Baker, herself later widely known as a critic, author, and playwright, and began his professional career in the town of Concord, which at that time was still the home of many of that brilliant circle which made it America's outstanding literary landmark.

After two years' residence there the young couple returned to Boston and Dr. Sutherland entered upon the many activities which endure in unbroken affiliation to this day.

His connection with Boston University School of Medicine has embraced, during this long span of years, the professorship of Anatomy, later the chair of Internal Medicine, and administration as acting Dean, Dean, and Dean Emeritus. At the time of his retirement from the active administration of the Medical School he was the Dean of Medical School Deans with a record of 25 years of unbroken service.

This academic record parallels his association with the Massachusetts Homeopathic Hospital which he has served as active member of the staff, in later years as consulting member and for more than two decades as trustee, in all an association of nearly forty years.

For two periods of fourteen and seven years respectively he was editor-in-chief of the *New England Medical Gazette* and is now a member of the editorial staff of this JOURNAL. In addition to these labors he has been a frequent contributor in several fields, as the numerous papers over his signature testify.

While these have been the outstanding affiliations of his long and busy life, numerous other public activities and interests have claimed him each in their degree.

In conclusion it may be said that his life represents an epitome of diverse services to his fellowmen, and in the vast group of friends, colleagues, students and associates, the years which he has spent thus have brought him the full meed, not only of respect and admiration for his talents and abilities as an administrator, teacher, writer and physician, but have added to that an element of warm personal affection and regard which his qualities as a man have ever engendered.

PRESENT OUTLOOK OF MEDICINE IN GERMANY

MEDICAL teaching and medical research at German universities today have declined greatly from their former standard. The vicissitudes of war and politics have left deep and permanent traces. Under the ever-growing pressure of circumstances, Germans tolerate defects and omissions of academic instruction, which were unheard of in pre-war times; they look upon these gaps with an apathetic eye, as if the rich and inventive spirit of modern science had no significance but as a preliminary to adding a few marks to the sick fund fees. There is no doubt that professors and medical men in Germany have a hard struggle for existence, and it is therefore not surprising that they think less of teaching than of a more profitable employment of their energies. The poor professional man is not a new class, but many of the evils of their position are new. Thus they are more dependent on ready money than formerly. They used to have credit; they now have to pay cash. The changes of the valuta have to be discounted, and the medical teacher falls into the hands of spec-

ulators. Moreover, political vicissitudes have added their influence to that of economical changes in disturbing that reverence for traditional scholarship which is the German's principle of action. He is in the midst of novelties for which he has little real sympathy—changes in political geography, changes of government, changes in bureaucratic management and police regulations. It goes without saying that all these influences, which tend to restrict or still further reduce the activity or *Tätigheit* of the teacher, must be prejudicial to the interests of the student.

An atmosphere of gloom hangs over the universities, and the isolation in which the foreign student finds himself is decidedly chilling. Of these foreign students there are not so many as formerly. The Japanese predominate and are to be found in the most obscure corners of Germany. Exactly what they do and their motives in coming to these places so far out of the beaten track remains more or less of a mystery, but they serve as an interesting connecting link between the prosaic American and Englishman and the untidy Russian. Most of the foreign students are in the departments of philology and philosophy, for medical, as compared with classical teaching, has languished. There are several factors at work in this decline of what was once a special feature of German university life. During the war Germany was cut off from many foreign publications in their original form, and students had to be content with abstracts of scientific articles, the result being that lecturers on medicine are sometimes surprisingly ignorant of what is common knowledge in England and America. Since the war the universities have been too poor to buy new books, periodicals, or pay subscriptions. The effect upon the style and subject matter of university lectures has been unfavorable from the visitor's point of view, for if he has read the recent literature, he cannot fail to be struck with the poverty of ideas and reference, a poverty which, from all indications, extends to clinical and hospital teaching.

The main contributory cause of the unsatisfactory condition of medical teaching is the cost of materials, raw and finished, and, above all, the slowness of the professors themselves, as a body, to break away from the inertia induced by post-war influences. As to the first, there is plenty of evidence that the hospitals and laboratories are short of food, medicines, anesthetics, blankets, bandages and linen, not to speak of new instruments and essentials of modern operative technique. Considering the close relation between such materials or equipment and effective medical, especially clinical, teaching, it is easy to understand the disintegrating and ruinous effect of the lack of them. Misfortune has followed upon misfortune, and the new year has opened inauspiciously for the foreign students at German universities.

TRANSFUSION

WHEN transfusion became a practical surgical procedure it was undertaken for the relief of a vast number of diseases. In some the beneficial effect was remarkable. In many others the results were disappointing. In certain conditions in which the early results were so disappointing as to make transfusion seem useless there is a tendency to give the method further trial with modified methods. Sepsis is the most important of these. In chronic sepsis particularly there is a tendency to look with favor on repeated transfusions.

In hemorrhages the value of transfusion is well established, yet there is still much difference of opinion as to the merits of citrated and whole blood. In hemorrhage of the newborn a few years ago the transfusion of whole blood seemed to be beyond question the only advisable procedure. Today the intramuscular injection is often advised. In hemophilia no progress whatever has been made, yet it is not unreasonable to expect that ultimately this terribly distressing condition may be treated as efficiently as are many conditions due to glandular deficiencies.

In the anemias of various types the general practitioner has hazy ideas as to the merits and possibilities of transfusion. Much progress has been made in technique, in methods, and in the application of transfusion, but the time is ripe for a clarification of our ideas. It is fortunate, therefore, that a meeting has been arranged at the Boston Medical Library next Wednesday evening, February 27, for the consideration of this important subject by such authorities as Dr. Richard Lewisohn of New York and those who have been asked to discuss his paper. Although the meeting is arranged by the Suffolk and Middlesex South Districts all physicians will be welcome.

DR. LEE RESIGNS AT HARVARD

DR. ROGER I. LEE has tendered his resignation as Henry K. Oliver professor of hygiene at Harvard University, to take effect at the close of the present academic year.

In the ten years that Dr. Lee has held this important post he has, through his gift for organization and his breadth of vision, welded the scattered branches of hygiene, health and physical education into a unified department, broad in scope and modern in activities. Physical soundness rather than physical strength has been made the basis for competition in athletics. Examination of freshmen and compulsory exercise for them have been inaugurated. Graded exercise to fit the individual has been introduced under the Department of Physical Education. The gymnasium, hitherto an independent organization, has been brought under the jurisdiction of the new department. Tennis, squash

and swimming have been opened up more fully for the mass of students; rowing has become popularized and the number of oarsmen on the river has grown enormously. The importance of athletics for the many, rather than for the few representative teams has been emphasized. A new era of physical education and physical well-being has dawned at Harvard under Dr. Lee's wise administration of his department.

Of equal importance have been the very valuable contributions that Dr. Lee has made to medical knowledge through this work. The examinations that have been made each year of large numbers of normal young men have served to set standards of normality that had been previously unknown. As concrete illustrations of this we may take the work on athletic hearts, exploding the universal erroneous theory that athletics might damage normal hearts; the occurrence and disappearance of harmless albuminuria; the significance of systolic murmurs and their disappearance with physical development, and the importance of posture on bodily function. These facts, as they have been made clear, have been given to the profession in a succession of very valuable publications by Dr. Lee and his associates as the tangible results of true and worthy medical investigation.

Perhaps not less valuable to the University, even if less spectacular, has been the formation of a competent medical service for the students, of consultation grade, equal to the task of giving medical opinions acceptable to the families and family physicians of the students.

His faculties have been recognized in other ways also, as a member of the administrative board and of the athletic committee, and of other important committees. His services as acting dean of the new School of Public Health, during a formative period in its development, are well known and have been recognized.

Dr. Lee's professorship has been interrupted on two occasions, in 1915, when he served as Honorary Major in the British Expeditionary Forces, with the Harvard Surgical Unit, and from May, 1917, to February, 1919, when he served first as Major in American Base Hospital No. 5 and later as Commanding Officer of this same outfit which was attached to the British. In September, 1918, he was ordered as Medical Consultant of the Third Army Corps, U. S. A. He engaged in the Marne-Aisne and Meuse-Argonne offensives, and served in the Army of Occupation. He was mentioned in despatches and cited by General Pershing and was given also a Citation by King George.

The chief service which Dr. Lee has performed for Harvard has been in the organization of the department. He now feels rightly that the task should be carried on by a younger man, while he returns to the original field in which he first made his name—the consultation practice of medicine.

Dr. Lee's loss will be greatly felt at Harvard, but it will be compensated for by the gain to the medical profession. The JOURNAL does not hesitate to prophesy that Dr. Lee will continue as one of our able leaders.

Legislative Matters

JOINT COMMITTEE ON STATE AND NATIONAL LEGISLATION

AT a meeting held February 15 it was voted to send the following notice to all the Boston daily papers:

The Joint Committee on State and National Legislation of the Massachusetts Medical Society and the Massachusetts Homeopathic Medical Society approves of the efforts of the public press to expose and rid the Commonwealth of Massachusetts of incompetent practitioners of medicine. We believe that these efforts can be best furthered by enactment of such legislation as will strengthen the State Board of Registration in Medicine.

ENOS H. BIGELOW, M.D., *Chairman,*
THOMAS J. O'BRIEN, M.D., *Secretary.*

Miscellany

NEW ENGLAND HEALTH INSTITUTE IN BOSTON IN MAY

ANOTHER great project for health education is launched! About 1000 people, including physicians, dentists, nurses, social workers, teachers, and others interested in public health, will gather in Boston May 5-10, with pencil and pad in hand. Pencil and pad, because this Institute is not merely a series of lectures; it is, rather, a study course on all aspects of public health, with the leading authorities in this field as instructors. The Institute is carried on under the auspices of the State Health Departments of New England, the U. S. Public Health Service, Yale and Harvard Schools of Public Health, and the Departments of Biology and Public Health of the Massachusetts Institute of Technology and Simmons College. There will be thirteen sections; each will meet for from five to nine-hour periods during the week. The chairmen of the sections are:

Section	*Chairman*
Venereal Disease	Dr. J. Edwards Kerney, Providence, R. I.
Tuberculosis	Dr. Robert Kerr, Manchester, N. H.
Foods and Food Control	Dr. E. Monroe Bailey, New Haven, Conn.
Social Work	Mr. Robert Kelso, Boston, Mass.

Chairman	*Section*
Preventable Diseases	Dr. F. X. Mahoney, Boston, Mass.
Mental Hygiene	Dr. D. A. Thom, Boston, Mass.
Nutrition	Miss Lou Lombard, Boston, Mass.
Health Education	Miss Mabel Bragg, Newton, Mass.
Child Hygiene	Dr. Richard M. Smith, Boston, Mass.
Industrial Hygiene and Accident Prevention	Dr. Holstead Murray, Framingham, Mass.
Sanitation	Prof. I. V. Hiscock, New Haven, Conn.
Public Health Nursing	Miss Margaret Stack, Hartford, Conn.
Health Administration	Dr. Thomas Tetreau, Portland, Maine

If you should wish to receive further information in regard to the Institute, including a preliminary program, or to register at this time, kindly communicate with Dr. Merrill Champion, Chairman of the Program Committee, Room 545, State House, Boston.

PUBLIC HEALTH SUMMER SCHOOLS

To Physicians and Sanitarians:

The United States Public Health Service takes pleasure in announcing that, in response to an extensive demand for summer school work in public health, it has arranged with Columbia University, the University of California, the University of Michigan, and the University of Iowa to conduct public health summer schools this year.

The faculties of these various summer schools will include many such leading specialists of the United States as Michael M. Davis (dispensary management), Robert H. Gault (criminal psychiatry), Emery Hayhurst (industrial hygiene), William J. Mayo (non-communicable diseases), E. V. McCollum and H. C. Sherman (nutrition), William H. Park (laboratory methods), Earl B. Phelps and George C. Whipple (public health engineering), M. J. Rosenau and Victor C. Vaughan (epidemiology), Thomas W. Salmon (psychotherapy), John H. Stokes (syphilis), Philip Van Ingen (child hygiene), C.-E. A. Winslow (public health administration), and Francis Carter Wood (cancer).

The Public Health Service has already received communications from several thousand physicians and sanitarians who hope to attend these summer schools. The widespread interest manifested thus early indicates that a large number will take advantage of this opportunity.

Further information may be obtained by applying to

H. S. CUMMING, *Surgeon-General.*

PROVISIONAL LISTS OF COURSES, 1924

COLUMBIA UNIVERSITY, NEW YORK CITY

July 7 to August 15

- Epidemiology
- Tuberculosis—Medical Aspects
- Tuberculosis — Community Aspects
- Syphilis
- Gonococcus Infection
- Social Hygiene
- Cancer
- Diseases of Heart, Diabetes, and Periodic Health Examinations
- General Bacteriology
- Applied Bacteriology—Elementary
- Advanced Micro-biology
- Introduction to Research in Applied Bacteriology
- Public Health Laboratory Methods I
- Public Health Laboratory Methods II
- Laboratory Diagnosis
- Laboratory Administration
- Management of Clinics and Health Centers
- Public Health Administration, including Rural Hygiene
- Public Health Law
- Public Health Engineering
- Sanitary Science
- Current Problems of Public Health
- Elementary Physiology
- Advanced Mammalian Physiology
- Special Physiology
- Psychology of Childhood
- Psychology of Adolescence
- Experimental Psychology
- Psychological Statistics
- The Psychology of Personality
- Lectures and Practice Work in Psychopathology
- Mental Hygiene, Its Personal and Social Aspects
- Principles and Practices of Psychotherapy and Diseases of Mentality
- Teaching Speech Correction
- Protective Social Work and the Delinquent
- Nutrition in Health and Disease
- Food Chemistry
- Physiological Chemistry
- Child Hygiene
- School Health Inspection
- Mouth Hygiene
- Vital Statistics and Health Administration
- Principles and Methods of Statistics
- Advanced Statistics
- Principles of Family Social Work
- Community Conditions and Family Welfare
- Physical Education—A full program of courses
- Public Health Nursing—15 courses open only to graduate nurses whose applications are accepted in advance

THE UNIVERSITY OF IOWA, IOWA CITY

June 9 to July 18

- Epidemiology
- Tuberculosis
- Syphilis
- Cancer
- Pediatrics
- Diseases of the Eye, Ear, Nose and Throat among Children
- Orthopedics
- Surgical Specialties
- General Bacteriology
- Special Bacteriology
- Public Health Laboratory Procedure
- Public Health Engineering
- Water and Sewage Disposal
- Management of Clinics and Health Centers
- Organization of County Health Centers
- Public Health Law
- State and Local Health Administration
- Rural Health Work
- Kinesiology
- Psychology
- Psychology of Child Development
- Abnormal Psychology
- Research in Psychology
- Speech Correction
- Mental Diseases
- Nutrition
- Oral Hygiene
- Dental Hygiene
- School Hygiene
- Physical Education in Public Schools
- Hygiene of Swimming Pools and Gymnasia
- Principles of Public Health Nursing
- Hospital Social Work
- Genetics and Eugenics
- Heredity and Genetics
- Population and Eugenics
- Urban Problems
- Charities and Corrections

THE UNIVERSITY OF CALIFORNIA, BERKELEY

June 23 to August 2

Epidemiology
Clinics in Preventive Medicine
Elementary Bacteriology
Protozoölogy (Lecture Course)
Protozoölogy (Laboratory)
General Biology
Public Health Laboratory
Public Health Administration Laboratory
The Health Center
Public Health Administration
Physiology (4 courses)
An Introduction to Psychology
Social Psychology
Problems of Social Mal-Adjustment
Medical and Psychological Problems (in Criminology)
The Abnormal Mind
Mind and the Organism
History of Experimental Psychology
Mental Hygiene
The Elements of Nutrition
The Nutrition of Development
The Physiology of Nutrition
Seminar in Nutrition
Advanced Biochemistry
Child Hygiene
School Hygiene
Physical Education (34 courses)
Social Hygiene in Public Schools
Principles and Practice of Public Health Nursing
Home Care of the Sick
Health Education
Statistics
Control of Poverty
The Logic of Argument
Public Speaking

THE UNIVERSITY OF MICHIGAN, ANN ARBOR

June 23 to August 2

Certain courses will continue two additional weeks.

Epidemiology and Communicable Diseases
General Hygiene and Public Health
Applied Hygiene and Public Health
Tuberculosis
Venereal Disease Control and Social Hygiene
Diseases of the Heart and Arteries
Diseases of the Kidneys
Principles of Animal Biology
Histology
Laboratory Work in Bacteriology
Vaccines and Serum Reactions
Clinical Microscopy
Special Pathology of the Infectious Diseases
Experimental Pharmacology
Physiological Chemistry, General and Advanced
Physiology: General, Mammalian and Human
Clinical Medicine
Food and Drug Analysis
Intensive Course in the Practice of Public Health Laboratories, offered by the Michigan State Department of Health, Lansing
Physical Examinations and Diagnosis
Management of Clinics and Health Centers
Public Health Administration
Industrial Hygiene
Sanitary Engineering
Elementary Psychology
Psychology for Public Health Nurses
Psychology of the Abnormal and Occult
Mental Hygiene and Psychiatry
Principles and Practice of Social Case Work, including Protective Social Work and Delinquency
Nutrition
Child Hygiene
Maternity Hygiene
School Hygiene
General Course in Physical Education for Women
General Course in Physical Education for Men
History and Fundamental Principles of Physical Education
Community Play and Recreation
Principles of Public Health Nursing
Vital Statistics
Elementary Methods in Statistics
Mathematical Theory of Statistics, General and Advanced
Theory of Probability
Social Organization
Social Evolution
Immigration
Criminology
Community Problems
Heredity
Principles of Economics
General Economics
Municipal Government
Elements of Journalism
Principles of Expression
Extempore Speaking

CLINICAL STAFF OF THE BOSTON DISPENSARY

AT the recent annual meeting of the Clinical Staff of the Boston Dispensary, officers were elected as follows: President, A. Warren Stearns, M.D.; Vice-President, T. Chittenden Hill, M.D.; Secretary-Treasurer, Oliver G. Tinkham, M.D.

The standing committees of the staff for the year 1924 are:

Advisory Committee: A. Warren Stearns, M.D., H. J. Inglis, M.D., Arthur H. Crosbie, M.D., William A. Hinton, M.D., Lesley H. Spooner, M.D.

Appointments: Elmer W. Barron, M.D., Hilbert F. Day, M.D., A. K. Paine, M.D., Henry T. Hutchins, M.D., Maynard Ladd, M.D.

X-Ray: John D. Adams, M.D., Willard S. Parker, M.D., Charles M. Proctor, M.D.

Massage: B. E. Wood, M.D., William P. Coues, M.D., Edmund B. Fitzgerald, M.D.

Food Clinic: William E. Preble, M.D., Maynard Ladd, M.D., Edward O. Otis, M.D.

SPRINGFIELD ACADEMY OF MEDICINE

THE regular meeting of the Springfield Academy of Medicine was held Tuesday evening, February 12.

Dr. George Henderson of Holyoke presented a case of "Abnormal Congenital Heart with Complete Transposition of the Vessels."

Dr. Allen Rice reported an interesting case.

Dr. John Blair Deaver, Professor of Surgery at the University of Pennsylvania, read the paper of the evening entitled, "Peptic Ulcer," demonstrated with lantern slides.

Discussion was opened by Drs. Ralph H. Seelye and Thomas Alcorn, followed by general discussion.

JAMES A. SEAMAN, *Secretary.*

CHILD WELFARE SURVEY IN PORTO RICO

A VARIED diet and good general health conditions tend to raise average weights and heights of children.

At least that is the indication of a child welfare survey made by the Children's Bureau of the U. S. Department of Labor in Porto Rico.

Seven thousand six hundred and thirty-two school children were weighed and measured in this island possession of the United States and their weights and heights compared with averages found in a study of Boston school children. It was found that the Porto Rico boys averaged about one inch less in height and the Porto Rico girls from one-half to one inch less in height than the American boys and girls of the same ages. Comparison of weight showed the Porto

Rican children from five to eight pounds lighter than the Americans.

Comparing the statistics for different communities in Porto Rico itself it was found that the children of districts where a higher standard of living conditions prevailed were taller and heavier than the average; where living standards were low, the opposite was true. In one of the districts where average weights and heights were low, it was found that 86 per cent. of the people had hookworm. Throughout Porto Rico, the people were found to have a badly restricted diet, many of the poor families living almost entirely on black, unsweetened coffee and a few tubers. In some districts virtually every person suffered from anemia, and the death rate from this disease, negligible in the United States, was 79 per 100,000 population, while the death rate from "rickets" (in reality malnutrition) was 103.9 compared with 0.6 for the United States.

Physical examinations of 7681 school children showed that 6599 of them needed treatment.

The Children's Bureau survey also showed a high rate of infant mortality; 162 out of every 1000 babies died during the first year of life compared with 76 for the United States.

CONFERENCE OF MARITIME QUARANTINE AUTHORITIES OF THE WEST COAST OF SOUTH AMERICA

DR. BELISARIO PORRAS, the President of the Republic of Panama, has called a conference to meet in Panama, R. P., on February 25, 26, 27, 28 and 29 for the purpose of considering the international standardization of maritime quarantine on the west coast of South America and the prevention of international spread of communicable disease in that litoral.

The Conference, which is under the immediate direction of the Hon. Col. Juan Antonio Jimenez, Secretary of Fomento y Obras Publicas, will hold formal discussions each morning at which will be taken up questions bearing upon maritime quarantine regulations; the methods, periodicity, and certification of ship fumigation; uniform quarantine declarations and uniform bills of health. Afternoons will be devoted to practical demonstrations of public health and hospital methods. Clinics will be held at Santo Tomas, Ancon, Corozal, and Palo Seco hospitals. There will also be demonstrations in municipal hygiene, garbage collection and destruction, public markets and refrigerating plants at Panama and Colon, R. P. The Conference will inspect the anti-malarial work which is being done by the Health Department of the Panama Canal and will make a study of ship fumigation with cyanogen chloride. The water works purification plant will be inspected and there will be a demonstration in public health laboratory methods at the laboratory of the Health Department of the Panama Canal. The Instituto Nacional and the Normal School will give an exposition of methods of teaching public health to children and the results in improved sanitation coincident upon the installation of the national road system of the Panaman Government will be shown. The Medical Association of the Isthmian Canal Zone will hold a special meeting at the Santo Tomas Hospital for the Conference. There will be a visit to the site of the Gorgas Memorial Institute, and it is believed that this will constitute one of the outstanding features of this international meeting.

There will be many social functions for the delegates, among the most notable of which will be dinners given by the President of Panama and the Herrick Clinic and luncheons tendered the Conference by the Rotary Clubs of Colon and Panama and the Panama and Colon Associations of Commerce.

The Secretary-General of the Conference is Surgeon William Colby Rucker, U. S. P. H. S., Chief Quarantine Officer of the Panama Canal. Physicians, surgeons, and public health workers visiting the Isthmus of Panama at the time of the Conference will be welcomed.

MEDICAL EDUCATION IN MASSACHUSETTS

THE following extract from the report of the special Commission on Education recently submitted to the Legislature, is of interest at the present time. The commission of seven members was appointed by the Governor under the terms of a legislative resolution approved May 9, 1922:

THE SITUATION IN REGARD TO MEDICAL EDUCATION

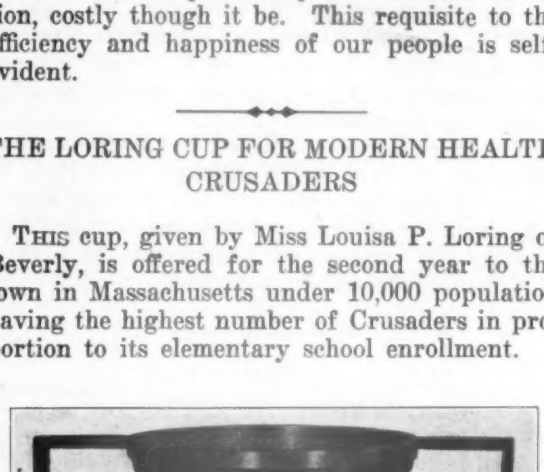
Massachusetts ranks very high among all the States in the Union in facilities for medical education, all of which is provided through private endowment. Unfortunately her standards of admission to the practice of medicine fixed by the State, place her among the half dozen lowest in this respect. This low standard encourages the establishment of schools of inferior grade which could only exist in a very few States in the Union. Graduates of low-grade medical schools may register as physicians in Massachusetts, though denied that privilege in all but three other States of the Union. The condition invites inferior graduates of inferior medical schools to locate in Massachusetts, while other States encourage superior graduates of superior medical schools to come to them, where the standards for admission to practice are higher.

The development of medical education during the last quarter of a century has been remarkable, and there are indications that this development has only begun. This progress has been accompanied by a tremendous increase in cost of medical education, which has become the de-

spair of university and college executives. The survey shows that the total annual university expense for medical education may easily reach $1000 per student; this, of course, does not include the student's personal expense. Notwithstanding this high cost, one of the primary obligations of society is a generous support of medical education. Health and physical strength are essential to material and spiritual prosperity; before culture and the refinements of civilization can be enjoyed, society must be protected from weakness and disease. Massachusetts cannot afford longer to evade a larger share of the responsibility for medical education, costly though it be. This requisite to the efficiency and happiness of our people is self-evident.

THE LORING CUP FOR MODERN HEALTH CRUSADERS

THIS cup, given by Miss Louisa P. Loring of Beverly, is offered for the second year to the town in Massachusetts under 10,000 population having the highest number of Crusaders in proportion to its elementary school enrollment.



Last year the cup was won by the schools of Merrimac, where the Crusaders are striving to win it again. If they succeed, it will become their permanent possession.

It is expected that the Massachusetts Tuberculosis League will be the contributor of a new silver cup to be given for Crusade work in cities. Now all our friends in Haverhill, Lynn, Brookline, Lawrence, Waltham, Newburyport, Plymouth, and other cities will have a chance to compete. We ought to have an interesting time this year with these tournaments, because we ought to have a lot of entries.

The cup will be awarded to the school system in Massachusetts of over 10,000 population having the highest fifteen weeks' enrollment of Modern Health Crusaders in proportion to its elementary school population during the school year 1923-24.—*Bulletin Massachusetts Legion of Modern Health Crusaders.*

STANDARDS FOR WHISKY AND BRANDY

ANNOUNCEMENT has recently been made by E. Fullerton Cook, Chairman of the Revision Committee of the United States Pharmacopoeia, that standards for whisky and brandy as medicines will be included in the new Pharmacopoeia now being revised. This is in response to a demand by the physicians of the country.

Under the national prohibition laws, whisky and brandy are classed as medicines, and as such are legally prescribed in many cases of serious illness, but at the present time no legal standards exist for their purity.

All physicians of the General Revision Committee, acting as a sub-committee, were appointed to study the situation and take the necessary action. This sub-committee has issued the following statement:

"In view of the fact that a large number of physicians in the United States believe alcohol to be a valuable therapeutic agent, and in view of the widespread adulteration of the alcoholic liquors at present available, the members of this Referee Committee feel that, for the protection of the public, there should be an official standard for medicinal spirits."

By including standards for whisky and brandy as medicines, in the Pharmacopoeia, which is the legal standard for drugs and medicines under the Food and Drugs Act, the machinery of the U. S. Department of Agriculture and of the Boards of Health and Boards of Pharmacy throughout the country is enlisted in protecting the sick against adulterated and poisonous products.

THE HAZARD OF GAS

WARNING as to the deadly hazards of gas in unventilated rooms and garages is again sounded by the Department of the Interior, through the Bureau of Mines. Seldom a day passes at this season of the year but the press records the death of one or more persons by asphyxiation in their homes or in their garages, the Bureau's statement recites. The past week has been especially prominent in this respect, particularly in the natural gas belt of Pennsylvania, Ohio, and West Virginia; while the fatalities from exhaust gas from automobiles is widespread. It should

never be forgotten that in the exhaust from an engine this gas is practically always present in exceedingly dangerous amounts.

Many house heaters have no flues for carrying off the waste gases, which then simply pass off into the rooms. If all windows and doors are closed, as they generally are in cold weather, the effect of these gases sooner or later becomes apparent on the occupants, who become dull and sleepy, and sometimes die. If a gas heater without a flue is used, a window should be partly open all the time—that is, up a half-inch or so. The Bureau of Mines has found that the atmosphere in a room should be changed at least once an hour—that is to say, the foul air should be displaced by fresh air during that period, but if there is a continuous fresh inflow, this takes care of the gases being given off, unless the individual is so close to the source of the waste gases as to breathe them before they are sufficiently diluted. Even heaters with flues should be in well-ventilated rooms. Never go to bed with a heater burning and the windows and doors closed. This is flirting with death.

At Pittsburgh, Pa., recently a man was found dead in a closed garage, a victim of asphyxiation, while at Grand Island, Nebraska, a man and a woman met a similar fate. If the engine of an atuomobile must be kept running while making repairs, the garage must be ventilated. Never crawl under a car when the engine is running, no matter how good the ventilation is. If it is desired to sit in an automobile with the engine running in order to keep warm, the garage must have proper ventilation.

Another hazard of exhaust gas, and one that is becoming better known, is that of sitting in a tightly closed automobile on a highway or elsewhere in the open, with the engine running. The car may be fitted with a leaky heater, through which the exhaust gas gets into and concentrates in the car, or else the exhaust from the muffler in some manner gets into and accumulates in the car. If people must sit in automobiles, they must have some fresh air entering the tonneau, otherwise they are toying with death and, if overcome, may be found frozen, as was recorded in one case last winter and one recently.

Simple written publications on hazards from house heaters and hazards of closed garages have been issued by the Federal Government, and may be obtained free from the Department of the Interior, Bureau of Mines, Washington, D. C.

REGISTRATION OF NURSES

More than 5800 registered nurses are in active service in Massachusetts as shown by the figures for the annual registration on file at the State House. This does not include the practical or those who are not classed as registered nurses.

DR. S. B. WOODWARD'S SPEECH BEFORE THE LEGISLATIVE COMMITTEE IN FAVOR OF HOUSE BILL 414 AND AGAINST SENATE BILLS 120 AND 121

Dr. Woodward has arranged for the printing of his arguments in support of vaccination. A copy will be sent to every member of the Legislature. If doctors will ask their representatives if they have read the pamphlet it will help to call attention to the arguments.

This pamphlet will furnish in available form material which physicians can use to advantage when the subject of vaccination is under discussion. Apply to Dr. Woodward for a copy.

HISTORY OF THE MASSACHUSETTS MEDICAL SOCIETY

Every Fellow who is financially able should own a copy of this book so that the story of an important medical society shall be spread abroad and handed down to posterity. Someone may read it if it is on your table, even if you have not the time. You can pass it along to your town library, where many persons will have the opportunity to consult it, both in the present and in the future. Buy a copy now by sending a check for $6.00 to Mr. James F. Ballard, 8 The Fenway, Boston. He will mail a book promptly.

FEES UNDER THE ENGLISH PANEL SYSTEM

Dr. J. B. Carrell of Hatboro, Pa., has worked out a mathematical analysis of the fees under the panel system in England. Under the plan proposed the annual fee paid to doctors is to be reduced from $2.28 to $2.04 for yearly service per individual patient. This reduction amounts to 559/1000 of a cent per day for each person for whom the physician must be ready to meet the call for service at any time and render all necessary care. German physicians, acting under practically the same custom, have declared a strike. English physicians are also planning to strike.

We trust that the good sense of the people of this country will operate to prevent the degrading practice of the panel system, which is disadvantageous to the patient quite as much as to the doctor.

MEDICAL SCHOOLS AIDED

Officials of the Rockefeller Foundation announce that at the December meeting of the organization a total of $2,725,000 was appropriated to the medical schools of two American universities and two Canadian universities. These appropriations were made in fulfillment

of various pledges made previously by the Foundation. In addition it was voted to continue certain fellowships in United States educational institutions.

Of these appropriations, $1,000,000 will go to the medical school of the University of Chicago, $1,000,000 to the medical school of the University of Toronto, and $225,000 to the medical school of the University of Iowa. The remaining $500,000 is for the endowment of the medical school of the University of Alberta. The fellowships to be continued are in physics, chemistry, medicine, and the biological sciences under the auspices of the National Research Council.

TRIP TO THE AMERICAN MEDICAL ASSOCIATION MEETING IN CHICAGO

PRESIDENT BIGELOW has approved the itinerary of a trip to the meeting of the American Medical Association in Chicago next June under the business direction of Raymond & Whitcomb Company. Copies of the itinerary will be mailed to members shortly.

The Massachusetts Medical Society party to the San Francisco meeting in 1923 was so successful that there is a real demand for a trip along similar lines to the Chicago meeting.

The party is expected to leave Boston on Tuesday, June 3, by way of the Hellgate Bridge route through New York, Philadelphia, and Baltimore to Washington. Washington is always new and always interesting. No attempt will be made to do the city thoroughly. That would require many days, but there will be a comprehensive drive around the city which will give those who are not familiar with it a general knowledge of this model capital. There will be also some free time for personal affairs.

After Washington will come two interesting novelties. The first will be a stop at Charlottesville, Va. Here in the mountains the party will have its first experience with Virginia hospitality. Part of the day will be given over to a drive to the top of Monticello Mountain, visiting Jefferson's former home and grave. The afternoon will be devoted to social affairs, including a visit to the University of Virginia.

Next after Charlottesville will be a stop at the famous White Sulphur Springs. For centuries White Sulphur Springs have been famous for their medicinal properties, but our party will be more interested in its scenic attractions, opportunities for recreation and the creature comforts offered by the Greenbrier Hotel. Here for two days members of the party will walk, ride, swim, play tennis, or strive to make new records on a golf course, said to be one of the most perfect in the world.

Departure from White Sulphur Springs will be in the morning in order to enjoy the superb scenery of the Alleghany Mountains, the Green River, and the Kanawha Valley. After a few hours' stop at Cincinnati the route will be direct to Chicago, reaching there on Monday morning, June 9.

The return from Chicago will be by way of Niagara Falls, Toronto, and thence by the Canada Steamship Lines through Lake Ontario, the Thousand Islands, and down the St. Lawrence to Montreal. The party will reach Boston on the return Tuesday morning, June 17, making a trip of just two weeks' duration at a season when the different sections visited offer ideal weather conditions and at a total cost of only $230. This price includes every necessary expense for the round trip except meals in Chicago.

Members of other State Associations are cordially invited to join. Reservations should be made at 17 Temple Place, Boston, or any other Raymond & Whitcomb Company office.

An optional trip will be announced later.

VENEREAL DISEASE IN CHILDREN OF SCHOOL AGE

DR. MARY MACNICOL, in an article on this subject in *Health and Empire*, comes to the following conclusions:

"To sum up—it is essential for the adequate handling of the V. D. problem, that the Ministry of Health and local authorities should take cognizance not only of the adults who become infected with syphilis or gonorrhea, but also of the many children who are innocent victims. To this end, close coöperation should be encouraged between antenatal, child welfare, school and venereal disease medical officers. Special clinics for mothers and children should be held in the same buildings and at the same time as the ordinary child welfare and antenatal clinics, and accommodation should be provided for infants and children in special V. D. wards."

SERUM FOR SCARLET FEVER

ANNOUNCEMENT has been made that Dr. A. R. Dochet, associate professor of medicine at Columbia College of Physicians and Surgeons, has reported favorable results following the use of serum treatment of scarlet fever. The statement is a conservative one, and no definite claims are made for definite curative powers, but rather that the result of the application of the agent by Dr. Francis G. Blake, professor of medicine at the Yale University School of Medicine, suggests probability of its value. The Rockefeller Institute, the Presbyterian Hospital, and the New Haven Hospital will continue experimental work with the serum, with the hope that in addition to the serum a vaccine will be developed that will prove to be preventive.

UNIVERSITY OF ILLINOIS

The Department of Public Welfare of the State of Illinois and the Board of Trustees of the University of Illinois have issued invitations to the exercises of the dedication of their new group of medical buildings at 2 o'clock, on Thursday afternoon, March 6, 1924, in the Library Building, Polk and Lincoln Streets, Chicago, Ill.

PARTS OF VITAMIN A DISCOVERED

At the annual meeting of the members of the Scientific Institute, held on December 6 at the council room of the Osaka Mainichi building, Osaka, Mr. Katsumi Takahashi, B.A., made a report on his investigation of vitamin A. Mr. Takahashi has been in the laboratory of Dr. Suzuki, who is well known for his researches on vitamin B, and after years of study discovered that the elements of vitamin A are composed of C_{24}, H_{44}, and O_2 and he named it biasterin. This discovery has been announced to the scientific world to the credit of the discoverer. In Mr. Takahashi's words, vitamin A is lacking in the Japanese food, and it is advisable that Japanese people take proper quantities of such foods as butter, egg-yolk and cod liver oil, which are rich in biasterin.—*The Japan Medical World.*

News Items

Removals.—Dr. James Lincoln Huntington has removed to 24 Marlborough Street, where he and Dr. W. T. Sherman Thorndike will continue their association.

Beverly Hospital.—A demonstration clinical meeting was held at the Beverly Hospital, Tuesday, February 19, at 4 p.m. Interesting cases were shown and discussed.

Lawrence General Hospital.—A clinical staff meeting of the Lawrence General Hospital was held on Tuesday, February 12, 1924. Subject, "Acute Pancreatitis." Chairman, F. D. McAllister, M.D.

Week's Death Rate in Boston.—During the week ending February 9, 1924, the number of deaths reported was 214, against 328 last year, with a rate of 14.37. There were 28 deaths under one year of age, against 36 last year. The number of cases of principal reportable diseases were: Diphtheria, 86; scarlet fever, 124; measles, 157; whooping cough, 2; tuberculosis, 38. Included in the above, were the following cases of non-residents: Diphtheria, 5; scarlet fever, 7; tuberculosis, 9. Total deaths from these diseases were: Diphtheria, 5; scarlet fever, 1; tuberculosis, 17. Included in the above, was the following case of a non-resident: Tuberculosis, 1.

Obituary

LUTHER EMMETT HOLT, M.D.

Dr. L. Emmett Holt, who died in Peking, China, on January 14, 1924, will perhaps be longest remembered as the author of a book, "The Care and Feeding of Children," which, through twelve editions, has been for twenty-five years an authority in the homes, not only of the United States, but of South America and Europe, and in China and Japan, where it has been invaluable in medical missionary work.

Recognized as a physician of the highest rank and standards, his influence with his profession was invaluable in removing doubts concerning the value of popularizing health education. After the Child Health Organization program had grown up under his stimulating leadership, he enthusiastically joined with several directors of the American Child Hygiene Association, of which he had formerly been president, in bringing about an actual consolidation of these two great organizations in the American Child Health Association, of which Secretary Herbert Hoover is the president, and of which Dr. Holt served as first vice-president from its beginning.

Dr. Holt was born on March 4, 1855, at Webster, N. Y., was graduated from the University of Rochester in 1875, took his master's degree three years later, and, in 1880, was graduated from the College of Physicians and Surgeons of Columbia University. Later, when his work had brought him fame, he received the honorary degrees of LL.D. from Rochester, and Sc.D. from Columbia and Brown Universities.

Dr. Holt's activities covered a wide field, but were devoted to a single interest. From 1890 to 1901 he was Professor of the Diseases of Children at New York Polyclinic, and from 1901 he was Professor of the Diseases of Children at the College of Physicians and Surgeons. At the time of his death, he was physician-in-chief at the Babies' Hospital, member of the Board of Directors and Secretary for the Rockefeller Institute for Medical Research, and Trustee of the University of Rochester. He was a member of the Association of American Physicians, retiring president of the American Pediatric Society, and a trustee of the New York Academy of Medicine.

He conducted important research on infant metabolism and was the author of a number of pediatric papers. His book on "The Diseases of Infancy and Childhood" has been the standard text-book in pediatrics in the medical schools of the country.

Though nearly seventy years old, he went to China in August, 1923, as special lecturer at the Union Medical College in Peking, an institution maintained by the Rockefeller Foundation. His death is a loss, not only to the nation, but to the world, whose children he made it his mission to save and serve.

GILBERT NORRIS JONES, M.D.

THE JOURNAL regrets to chronicle the death of Dr. Gilbert N. Jones, for many years a general practitioner of Wellesley Hills, at his home in that town after a long illness on January 26, 1924. Dr. Jones was born at Bangor, Me., March 19, 1862. He was graduated from Harvard College, *magna cum laude*, with the class of 1884, entering Harvard Medical School at once and receiving an M.D. there in 1888. Then he was house officer at the Boston City Hospital and at the Boston Lying-In Hospital, settling in practice in Gloucester, Mass., and moving to Wellesley Hills in 1898. While in Gloucester he was married to Miss Margaret Atwater. They had one child, a daughter. Among his memberships he numbered the American Medical Association, the Massachusetts Medical Society, and various local societies. At one time he represented the Middlesex South District Medical Society as a councilor. A scholarly physician, so quiet and retiring that he was at a disadvantage in the keen competition with more assertive practitioners, he gave valued advice to a large clientele who, with a host of friends, will miss him sadly.

GEORGE L. PERRY, M.D.

DR. GEORGE L. PERRY, aged 74 years, town physician for approximately ten years, and chairman of the Board of Health, died January 13, 1924, at his home, Athol, Mass., following an illness of three weeks from heart disease. He was one of the most widely known physicians in this section of the State, having practiced in Athol for 31 years and had served as chairman of the Board of Health.

Born at Woodstock, Vt., son of Thomas J. and Mary (Atherton) Perry, he was left motherless at the age of eight years, being forced to work his way through school. Following education in the village schools, he entered Dartmouth Medical School, from which he was graduated in 1878. He first practiced in Conway and Harrisville, N. H., and later located at Baldwinsville, Providence, R. I., Petersham and Williamsburg. He had been a leading physician of Athol for about 31 years.

Fraternally he was affiliated with Star Masonic Lodge and associated bodies, and was a member of Themis Chapter, O. E. S. He was also a member of the Massachusetts Medical Society, and especially active in the Worcester North District Society.

Surviving him are his widow, Mrs. Emma J. (Chase), and a son, Dr. Charles D. Perry of Hartford.

DEATH NOTICES

DR. EDWARD MORTIMER LEACH died at Rochdale February 1, 1924, at the age of 54. He was a graduate of Albany Medical College in 1893, settled in Rochdale in 1894 and joined the Massachusetts Medical Society in that year.

Effects of war service—when he was a member of the 101st Ambulance Corps in France—caused the death of Dr. Peter George McKenna of 38 Rockland Street, Canton, February 4, 1924. He was gassed overseas and never fully recovered from his experiences during the World War. Dr. McKenna was 31 years of age. He was a member of the Canton School Committee, the John Flatley Council, K. of C., and of the Edward Beatty Post, American Legion. He was a graduate of Baltimore Medical College in 1911.

DR. THOMAS WALTER PROCTOR, a graduate of the Massachusetts College of Pharmacy (1887) and of Harvard Medical School (1894), formerly a practitioner in Boston, died in Barbados, where he had gone for his health, January 15, 1924. He was born in Burford, Ontario, Canada, and came to the United States when he was fifteen years of age. He began practice in 1894 and after two years of service at the Carney Hospital he practised in Boston for many years, until he broke down with heart trouble. He went back to practice three different times, but was finally forced to retire on account of his health. Dr. Proctor was married in 1911 to Miss Bertha C. Upham of Malden. They made their summer home at Sagamore Beach and their winter home in Florida.

Correspondence

LONDON LETTER

[From Our Own Correspondent]

London, Dec. 21, 1923.

VACCINATION IN GREAT BRITAIN.—Figures regarding vaccination in this country are very disquieting. They indicate that each year fewer persons are vaccinated against smallpox. The statistics for London, which were presented at a recent meeting of the Metropolitan Asylums Board, are especially alarming. These show that the number of successful vaccinations in London had fallen in 1921, the last year for which figures are available, to considerably less than fifty per cent. of the number of births. But although the figures for London may rightly be termed alarming, it is not correct to state that they are especially so as London is by no means most to blame in this respect. There are other areas of Great Britain in which vaccination has fallen even more into disrepute than in the metropolis. It really required little perspicacity to predict, as it was predicted longer ago than ten years, that such a disregard of vaccination could have but one result,—a return of smallpox on a large scale. This prediction is in the course of fulfilment. The average number of fresh cases has risen from nineteen, or thereabouts, in 1922 to in the neighborhood of forty-six in the present year. In addition the disease is now virtually endemic in certain districts in the middle and in the North of England. More recently it has appeared in the outskirts of London, and sharp outbreaks are at present in progress in other parts of the country. Thus far the cases have been of a mild type. There are indications, however, that a more virulent form is likely to be witnessed soon. This eventuality was also predicted, because it is in the nature of disease, as shown by history, to increase in violence and virulence as fresh cases occur.

It seems futile in this country to preach or write on the immunizing properties of vaccination properly performed, as it invariably is performed nowadays, for the reason that the masses have been taught to be prejudiced against it and they are determined

to learn nothing. The teaching of history falls on deaf ears. There is no one so difficult to convince as the self-satisfied, ignorant individual—except when there is a "scare" of smallpox; when people die quickly from it, this country abounds in conscientious objectors; *pox populi* in Great Britain now is, indeed, *vox Dei*, and politicians cater to the views of the masses, however much these may be inspired by ignorance. The conscientious objectors' clause provides a loophole for those who wish to escape the slight inconvenience of vaccination and who care little because they are indifferent to it, through lack of power of comprehension, of the menace unvaccinated persons are to their fellow creatures when a virulent epidemic of smallpox is raging. Freedom to do what one wishes seems to be the slogan of the day here, no matter what the results may be, nor how grievously the innocent and sensible may suffer for the sins of the careless and headstrong.

Therefore, it is probably true that in spite of all considerations, the propaganda against vaccination will continue. An announcement was made at the meeting of the Metropolitan Asylums Board, referred to previously, which should cause one to think furiously. It was this,—that of the thirteen cases of smallpox which occurred in London during the autumn of this year four were unvaccinated and eight had not been vaccinated since infancy. One of the unvaccinated cases, and one of the cases vaccinated in infancy (a man of fifty) died. Three unvaccinated cases and seven cases vaccinated in infancy recovered. As a matter of fact, no recently vaccinated individual contracted the disease, while the recovery rate was twice greater in those vaccinated in infancy than in those entirely unvaccinated. But such proofs of the efficacy of vaccination are common. It not only renders the person largely immune to the disease but, if the disease is contracted, is a protection in so far as the virulence of the malady is strikingly modified. Moreover, under existing conditions, vaccination is safe and clean. The efficacy of Jenner's discovery has been proved up to the hilt, time after time, and those who oppose it are a standing menace to the health of the community. It may be said, most emphatically, that it is obviously the duty of all to avail themselves of what is known to be the only protection against smallpox, for the sake of the children.

CENTENARY DINNER OF THE *Lancet*.—On November 29 a dinner was given to the *Lancet* in celebration of its one hundredth birthday. There were present more than four hundred of the medical profession, and other guests. Representatives of medicine and surgery, from all parts of Great Britain, attended.

Among these and invited guests were S. G. Crute, de Saint-Aulaire, French Ambassador; Lord Hewart, Lord Chief Justice of England; Viscount Burnham, Proprietor of the *Daily Telegraph;* The Lord Mayor of London; Lord Riddell, The Presidents of the Royal College of Physicians and Royal College of Surgeons; Sir Squire Sprigge, Editor of the *Lancet*, and Sir Dawson-Williams, Editor of the *British Medical Journal;* Mr. Percy Dunn, representing the *Medical Press* and *Circular;* Sir Donald MacAlister, President of the General Medical Council, was in the chair. The dinner was excellent and, for the most part, the speaking was in keeping with the variety and tasty succulence of the bill of fare.

The toast of the profession was proposed by Lord Hewart, who took occasion to refer to the law on or rather the determination of insanity, a subject under discussion with a view to revision at the present time. He pointed out that there was a serious conflict of opinion upon the difficult question of insanity, between the view of the lawyer and the view of the physician. He expressed no opinion on the subject, but there had been set up recently a committee of lawyers who had inquired into the matter and, as he understood, the report of that committee contained a recommendation for something which, if adopted, would undoubtedly mean a wide expansion of the criminal law. At present if a person was to be held not responsible for a crime upon the ground of insanity, he must fulfil one of two tests. He must satisfy one of two conditions, either that by reason of infirmity of mind he must not know that what he was doing was wrong, or he must not know what he was doing at all. That was an ancient maxim of English law. Medical science was to be understood not satisfied with these two alternatives. It suggested, at least, a third alternative, that a man might know what he was doing and might know what he was doing was wrong, and yet by reason of disease of mind might be uncontrollably compelled to commit that act. It was this condition, which he understood, was now recommended by the committee upon the advice of eminent specialists. He expressed no opinion, but one thing was clear: If that was indeed to be the law, and *salus populi suprema lex*, he did not suggest that we should launch upon a sea which had no shore, but, at any rate, we should launch upon a sea of which the shores were far more widely separated than were the shores which, as lawyers, they had hitherto known.

Sir Humphry Rolleston, President of the Royal College of Physicians, London, responded to the part of physicians in an eloquent speech, while Sir John Bland Sutton, the President of the Royal College of Surgeons, enlivened the proceedings by a typically witty and humorous address. Sir Berkeley Moynihan then proposed the health of the *Lancet*, which was seconded by Viscount Burnham.

Sir Squire Sprigge, the Editor of the *Lancet*, in responding said, in part, that those responsible for the conduct of the journal had had before them over the century two ideals, the maintenance of the status of medicine and the diffusion of medical knowledge, and to their accomplishment their best endeavors would be used. The centenary dinner of the *Lancet* was a milestone on the road to progress and not their obituary tombstone. And as for himself, while he thanked the audience from the bottom of his heart for the kind reception of his association with the toast, he must say that he was only the robin sitting on the milestone twittering to call attention to the particular stage of the journey. They did not erect the stone; the members of the audience and their predecessors did that, and it was through their continued support and unvarying coöperation that they hoped to make the rate of progress at future stages—Sir Squire Sprigge emphasized the point that they depended upon their friends and not only was the *Lancet* a friend-made paper, but he was a friend-made man.

Sir Ernest Hodder-Williams, the chairman of the *Lancet*, and one of its proprietors, also responded saying that the new owners had made a vow and pledge that they would, as far as in them lay, do nothing which might leave the slightest stain of dishonor on a most highly honored name. That pledge they had tried to keep, and should try to keep it in the future, even though it should mean, as in the case of Wakley, having their houses burned down and gutted, even if it meant that they had to fight half a dozen libel cases in as many years, even if it meant—which Heaven forbid!—that one of them had to enter Parliament. Sir Hodder-Williams gave testimony, no doubt well deserved, to the ability and loyal coöperation of Sir Squire Sprigge, and thanked him and his staff for the way in which they had worked with the new management.

A speech well deserving of notice was that of Sir Dawson-Williams, the Editor of the *British Medical Journal*. He reviewed in an analytical and interesting manner medical journalism. He pointed out that a

general medical journal not only had to have financial support from the profession but the kindly helpful support. He also drew attention to the fact that the conduct of a medical journal did not get more smooth, and not the least of the difficulties with which the editor had to contend was the inordinate length at which so many authors wanted to write. In this respect, probably, Sir Dawson-Williams will have the sympathetic concurrence of editors of medical journals in America as well as in this country. However, it is not given to all to be able to express their meaning clearly in a few phrases. In short, we are not all of us Kiplings, or nearly so. It may be remarked that, speaking generally, the writer in the English language, and especially in medical journals, does not possess, as a rule, the faculty of writing lucidly, logically, and to the point. This gift belongs to French writers more than to those of any nation.

ANNUAL DINNER OF THE ROYAL SOCIETY OF MEDICINE.—On Dec. 4, the Prince of Wales, as an Honorary Fellow of the Royal Society of Medicine, attended the annual dinner, held in the Hotel Victoria, London, and presided over by the President of the Society, Sir William Hale-White. In the speech the Prince pointed out that the society was the result of fusion of sixteen medical societies and he believed that every member of it would agree that it, and all its elements, had grown, not sixteen fold, but sixty fold stronger in consequence. He further laid stress on the undoubted fact that this achievement was largely due to the energy and perseverance of Sir John MacAlister, the secretary of the society. The President, in his speech, said that the society was continually progressing and it had over 4,000 members and Fellows. They had 120,000 books in their library, and during the past year they had sent out 3,000 parcels of books to Fellows resident in the country, and the Dominions overseas. Their Secretary, Sir John MacAlister, was largely responsible for the success they had achieved.

KING EDWARD'S HOSPITAL FUND FOR LONDON.—King Edward's Hospital Fund for London this year shows a very considerable increase and gives rise to the hope that the voluntary hospital system with certain modifications will be able to continue.

DEATH OF SIR FREDERICK TREVES.—Sir Frederick Treves, best remembered in America perhaps, as the surgeon who took upon himself the responsibility of operating on King Edward shortly before the date fixed for his coronation, died at Lausanne, Switzerland, on December 7, last, aged 70 years. Treves was a great surgeon and an excellent writer, both on surgical and literary and general subjects. He retired from hospital work at the age of 45, because his private practice was so large, and he retired from practice at the age of 55 because in his opinion no surgeon should operate after that age. Treves was a great traveller and wrote several books of travel. He was a writer of much distinction.

DEATH OF MR. SYDNEY HARBY STEPHENSON, M.B., F.R.C.S., Edin.—in London on December 16, at the age of 62. He devoted special attention to diseases of the eye in children, and wrote the standard monograph in English on ophthalmia neonatorum. He will be chiefly remembered by ophthalmologists as the founder of *The Ophthalmoscope*, a periodical which was issued monthly from 1908 to 1916, when it was incorporated with other journals in the *British Journal of Ophthalmology*. In spite of serious physical disabilities Mr. Stephenson continued to edit this journal up to the day of his death. He was a voluminous writer on his special subject.

AID FOR GERMAN INTELLECTUALS

New York, February 7, 1924.

Mr. Editor:

The New York *Times* of the 6th inst. contained a letter from Mr. Paul R. Reynolds in which it was stated that one of the last acts of our great ex-President Woodrow Wilson was a promise to help the German intellectuals in their present distress. And yet the German embassy in Washington failed to display its flag at half-mast at the death of that great man. What a contrast! Here was a man who had occupied the highest position in a great republic, expressing his good will and willingness to help people in distress in Germany, which only a little while before had been considered an enemy country, and there the officials of the very people whom Mr. Wilson wished to help, showing pettiness and indifference at the passing away of this great figure when the rest of the civilized world bowed its head in sorrow and respect.

Mr. Reynolds, in admiration of Mr. Wilson's magnanimity, offers a contribution of $100 in his memory to a newly formed "Society for the Relief of German Intellectuals," of which former Ambassador James W. Gerard is president and Edward R. Stettinius, of 23 Wall Street, New York, treasurer. I have not been able to learn whether this society will include the medical profession among its beneficiaries. May we all hope so. From reports made by American physicians who have visited Germany recently, it would seem indeed that, of all professions suffering under the unhappy economic conditions of Germany, the medical profession seems the most unfortunate.

Mr. Gerard's organization is to my knowledge the fourth society in this country which aims to come to the relief of the German intellectuals. These are, first, the "Emergency Society for German and Austrian Science and Art," of which Professor Franz Boas of Columbia University is the president and Mr. James Speyer, New York, the treasurer. Secondly, "American Aid for German Medical Science," with Dr. Ludvig Hektoen of Chicago as president and Dr. William F. Petersen as treasurer. Thirdly, there is the "Association for the Relief of Needy Physicians of Central and Eastern Europe," with Professor William H. Welch of Baltimore as honorary president, Dr. Max Einhorn as chairman of the New York Section and Mr. Henry Steneck as treasurer. Besides these, there is a Dr. Henry Loeffler of Vienna, who is going about New York City and the country at this time collecting funds for the relief of the suffering physicians of Austria. On inquiry at the Austrian consulate in New York and of the chargé d'affaires of Austria in Washington, I was told that Dr. Loeffler had presented a letter addressed to himself by the Association of German Physicians in Austria, giving him authorization to collect funds, but that neither the legation nor the consulate had been directly informed of his mission by the above-named society.

I cannot help thinking that in these manifold activities, striving to come to the relief of the intellectual class of Germany and Austria, there is too great a multiplication of effort, which entails increased expense in collecting and handling the funds, all to the detriment of those for whom these benevolent works are inaugurated. Would not a uniting of all these societies result in a more substantial, economic, and more judicious distribution of the funds?

S. ADOLPHUS KNOPF, M.D.

16 West Ninety-fifth Street.

NOTICES

NEW ENGLAND ROENTGEN RAY SOCIETY

Meeting at Medical Library, Friday, February 29, 8 p.m. Symposium on Radium and Roentgen Therapy by Staff of New York Memorial Hospital.

Speakers: Drs. Burton J. Lee, Douglas Quick, William P. Healy, William S. Stone.

P. F. BUTLER, *President.*

HARVARD MEDICAL SOCIETY

The next regular meeting of the Harvard Medical Society will be held as usual in the amphitheatre of the Peter Bent Brigham Hospital, February 26, 1924, at 8.15 p. m. The program follows:

1. Exhibition of cases.
2. Experimental Studies on Healing of Meninges. Dr. Samuel C. Harvey, Yale Medical School.

All members of the medical profession, medical students and nurses are invited.

GILBERT HORRAX, *Secretary.*

THE NORFOLK DISTRICT MEDICAL SOCIETY

A regular meeting of the society will be held at Masonic Temple, 171 Warren Street, Roxbury, February 26, 8.15 p. m.

Business:

The Value of the Newer Laboratory Tests in Private Practice, Charles H. Lawrence, M.D.

Discussion, A. W. Rowe, Ph.D.

BRADFORD KENT, M.D., *Secretary.*

MEETING OF THE SURGICAL SECTION OF THE SUFFOLK DISTRICT IN ASSOCIATION WITH THE MIDDLESEX SOUTH DISTRICT

A meeting of these societies will take place February 27, 1924, in the Medical Library Building.

Dr. Richard Lewisohn of New York will read a paper on the subject: Transfusion.

The discussion will be opened by Dr. Roger I. Lee, to be followed by Drs. Arthur R. Kempton, Thomas E. Buckman, Howard W. Clute and A. W. Reggio.

Doctors are invited.

BOSTON CITY HOSPITAL STAFF CLINICAL MEETING

Cheever Surgical Amphitheatre, Friday, March 7, 1924, at 8.15 p. m.

Early and Late Stages of Diseases of the Rectum, T. Chittenden Hill.

Open discussion.

Physicians, medical students and nurses invited.

Refreshments.

JOHN J. DOWLING, *Superintendent.*

MASSACHUSETTS GENERAL HOSPITAL

A course in "Medicine and Pathology" will be given in the Amphitheatre of the Pathological Laboratory by Dr. William H. Smith, Visiting Physician of the Massachusetts General Hospital, and Dr. Oscar Richardson, Assistant Pathologist of the Massachusetts General Hospital.

The complete clinical records of cases coming to autopsy will be presented by Dr. Smith, who will discuss the differential diagnosis. The pathological findings will then be stated, the organs demonstrated and the pathology of the cases discussed by Dr. Richardson. This will be followed by a general discussion of the cases viewed in the light of the completed records, and attention will be called to the newer diagnostic methods and to the broad principles of treatment involved. Microscopical preparations and lantern slides will be used when necessary.

There will be nine exercises on Wednesdays in the months of March and April, between 3.15 and 5.15 p. m.

The course is open to graduates in medicine and medical students of the third and fourth year, subject to their acceptance by the hospital.

Women admitted.

Given in connection with the Harvard Graduate School of Medicine.

A fee of $5 will be charged for the course. Application should be made to

FREDERIC A. WASHBURN, M.D., *Director,*
Massachusetts General Hospital, Boston, Mass.

WESTERN ELECTRO THERAPEUTIC ASSOCIATION

The sixth annual meeting of the Western Electro Therapeutic Association will be held in the Little Theatre, Kansas City, Mo., Thursday and Friday, April 17 and 18, under the presidency of Dr. Harry H. Bowing of Rochester, Minn. A cordial invitation is extended to the medical profession of nearby States.

The preliminary program follows:

"Clinical and Histological Observations in the Treatment of Neoplastic Diseases," Dr. William L. Clark, Philadelphia, Pa.

"The Pathology, Diagnosis and Treatment of Skin Diseases," Dr. C. D. Collins, Chicago, Ill.

"Coagulation Essentials" (lantern slides), Dr. T. Howard Plank, Chicago, Ill.

"Electro-coagulation in Cancer of the Uterus" (lantern slides), Dr. A. David Willmoth, Louisville, Ky.

"What the European Clinics Think of High Frequency Currents," Dr. Joseph E. G. Waddington, Detroit, Mich.

"The Use of Physiotherapy in the Reconstruction of the Industrial Injured," Dr. James E. M. Thomson, Lincoln, Neb.

"The Physio-Therapeutic Treatment of Colitis," Dr. Curran Pope, Louisville, Ky.

"The Use of the Cobalt Blue Lens with Ultra Violet Therapy in the Treatment of Luetic Ulcers," Miss Emma Leah Stewart, Louisville, Ky.

"Radium," Dr. Sanford Withers, Denver, Colo.

"Blood Pressure Interpretations," Dr. Burton B. Grover, Colorado Springs.

Dr. R. W. Fouts, Omaha (title not announced).

"Bright's Disease Treated by High Frequency Currents," Dr. Omar T. Cruikshank, Pittsburgh.

Dr. E. H. Skinner, Kansas City (title not announced).

Dr. William L. Clark and Dr. T. Howard Plank will hold an operative clinic at General Hospital on Friday.

On Tuesday evening, April 15, there will be a joint meeting of the association with the Jackson County Medical Society, papers being presented by Drs. Clark and Bowing.

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces an open competitive examination for medical interne (psychiatric).

Applications will be rated as received until June 30. The examination is to fill vacancies in St. Elizabeth's Hospital, Washington, D. C., at an entrance salary of $1200 a year and maintenance. Appointees may also be allowed the increase of $20 a month granted by Congress.

Applicants must have graduated from a recognized

medical college, or be senior students in such an institution and furnish proof of actual graduation within eight months from the date of making oath to the application. Applicants must not have been graduated prior to the year 1920 unless they have been continuously engaged in hospital, laboratory, or research work along the lines of neurology or psychiatry since graduation.

Competitors will not be required to report for examination at any place, but will be rated on their general education, technical training and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of United States civil service examiners at the postoffice or custom house in any city.

DISEASES REPORTED TO MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

Week Ending January 19, 1923

Disease	*No. of Cases*	*Disease*	*No. of Cases*
Anterior poliomyelitis	2	Pneumonia, lobar	130
Chicken-pox	878	Scarlet fever	528
Diphtheria	229	Septic sore throat	6
Dog-bite	3	Syphilis	44
Encephalitis lethargica	1	Suppurative conjunctivitis	17
Epidemic cerebrospinal meningitis	2	Trachoma	2
German measles	5	Tuberculosis, pulmonary	159
Gonorrhea	78	Tuberculosis, other forms	24
Influenza	10	Typhoid fever	12
Malaria	1	Whooping cough	144
Measles	538		
Mumps	285		
Ophthalmia neonatorum	22		

Week Ending January 26, 1924

Disease	*No. of Cases*	*Disease*	*No. of Cases*
Anterior poliomyelitis	4	Scarlet fever	450
Chicken-pox	379	Septic sore throat	3
Diphtheria	246	Smallpox	2
Dog-bite requiring antirabic treatment	4	Syphilis	35
Dysentery	1	Tetanus	1
Encephalitis lethargica	4	Suppurative conjunctivitis	17
Epidemic cerebrospinal meningitis	2	Trachoma	1
German measles	17	Trichinosis	13
Gonorrhea	87	Tuberculosis, pulmonary	105
Influenza	12	Tuberculosis, other forms	23
Measles	443	Typhoid	9
Mumps	265	Whooping cough	136
Ophthalmia neonatorum	20	Hookworm	1
Pneumonia, lobar	103		

Week Ending February 2, 1924

Disease	*No. of Cases*	*Disease*	*No. of Cases*
Actinomycosis	1	Pneumonia, lobar	131
Anterior poliomyelitis	1	Scarlet fever	492
Chicken-pox	355	Septic sore throat	1
Diphtheria	256	Syphilis	45
Dog-bite requiring antirabic treatment	1	Suppurative conjunctivitis	26
Encephalitis lethargica	4	Trachoma	3
Epidemic cerebrospinal meningitis	4	Trichinosis	2
German measles	13	Tuberculosis, pulmonary	118
Gonorrhea	111	Tuberculosis, other forms	19
Influenza	8	Typhoid fever	9
Measles	695	Whooping cough	121
Mumps	288		
Ophthalmia neonatorum	13		

ACKNOWLEDGMENT OF BOOKS FOR REVIEW

The Journal acknowledges the receipt of the following books for review:

Handbook of Surgery. George L. Chiene. New York: William Wood & Co. Pp. 592. Price $4.50.

Hospital Corps Handbook—United States Navy—1923. Washington: Government Printing Office. Pp. 717.

Local Anaesthesia Methods and Results in Abdominal Surgery. Prof. Dr. Hans Finstere. New York: Rebman Co. Pp. 349. Price, $5.00.

Minor Maladies and Their Treatment. Lenord Williams. New York: William Wood & Co. Pp. 414. Price $3.25.

Diagnosis and Treatment of Acute Abdominal Diseases. Joseph E. Adams. New York: William Wood & Co. Pp. 558. Price $6.00.

Oral Hygiene. J. Sim Wallace. London: Bailliere, Tindall & Cox. Pp. 76. Price $5 net.

Diseases of the Skin. Richard L. Sutton. St. Louis: C. V. Mosby Co. Pp. 1214. Price $10.00.

Diagnostic Methods. Herbert Thomas Brooks. St. Louis: C. V. Mosby Co. Pp. 109. Price $1.75.

An Introduction to the Study of Mental Disorders. Francis M. Barnes, Jr. St. Louis: C. V. Mosby Co. Pp. 295. Price $3.75.

A Practical Text-book of Infection, Immunity and Biologic Therapy, with special reference to immunologic technic. John A. Kolmer. Philadelphia and London: W. B. Saunders Co. Pp. 1210. Price $12.00 net.

MEMBERS WHOSE DUES ARE UNPAID

The time is almost at hand when the list of members entitled to the Journal will be revised. By direction of the Council the names of members whose dues are unpaid will be taken from list of those who are entitled to the Journal.

SOCIETY MEETINGS

District Societies

Bristol South District Medical Society:
The annual meeting will be held in New Bedford, May 1, 1924.

Essex North:—Annual meeting at Lawrence General Hospital, May 7, 1924.

Essex South District Medical Society:
March 19, 1924:—Salem Hospital.
May 7, 1924:—Annual meeting, Relay House, Nahant, in conjunction with Lynn Medical Fraternity.

Franklin District:—Society meets at Greenfield the second Tuesday of March, May, July, September. Annual meeting in May.

Hampden District:—The meetings for the year are as follows:
April, 1924, at Springfield; annual meeting.

Hampshire District Medical Society:
Meetings held bi-monthly, the second Wednesday in the month, at Boyden's Restaurant, Northampton.

Middlesex South District Medical Society:
February 27, 1924:—Combined meeting with the Surgical Section of Suffolk District at the Boston Medical Library.
March, 1924:—Hospital meeting; place not yet determined.
April, 1924:—Annual meeting.

Norfolk South District:—Meetings first Thureday of each month at 11:30 a. m., February, March, April and May, at United States Hotel, Boston. The February and May meetings are stated meetings.

Suffolk District Medical Society:
February 27, 1924:—Meeting of Surgical Section, in association with the Middlesex South District at the Boston Medical Library at 8:15 p. m.
March 26, 1924:—Meeting of the Medical Section, in association with the Boston Association for the Prevention and Relief of Heart Disease, at the Boston Medical Library at 8:15 p. m.
April 30, 1924:—Annual meeting to be held at the Boston Medical Library at 8:15 p. m.

Worcester District:—The meetings for the year are as follows:
March 12 at City Hospital, Worcester.
April 10—A public meeting.
May 8—Annual meeting.

State, Interstate and National Societies

Schedule of meetings of the *New England Dermatological Society:*
Wednesday, April 9, 1924, at 8 p. m., in the Surgical Amphitheatre, Boston City Hospital.